1080P
Direct View LCD
Training



42LH90





LED Backlights

Original February 09, 2010
Updated July 28, 2010

OUTLINE

Preliminary Section:

Contact Information, Preliminary Matters, Specifications,
LCD Overview, General Troubleshooting Steps,
Signal Distribution, Disassembly Instructions and Voltages

Disassembly Section: Removal of Circuit Boards

Troubleshooting Section: Board Operation Troubleshooting of :

- Switch Mode Power Supply
  - Inverter Board (LED Backlight Driver)
    - T-CON (TFT Controller) Panel Driver board
      - Main Board
        - Ft Control Board
          - Side Keys
            - Speakers



42LH90 LCD Direct View Display

Section 1

This Section will cover Contact Information and remind the Technician of Important Safety Precautions for the Customers Safety as well as the Technician and the Equipment.

Basic Troubleshooting Techniques which can save time and money sometimes can be overlooked. These techniques will also be presented.

This Section will get the Technician familiar with the Disassembly, Identification and Layout of the LCD Display Panel.

At the end of this Section the Technician should be able to Identify the Circuit Boards and have the ability and knowledge necessary to safely remove and replace any Circuit Board or Assembly.



IMPORTANT SAFETY NOTICE

The information in this training manual is intended for use by persons possessing an adequate background in electrical equipment, electronic devices, and mechanical systems. In any attempt to repair a major Product, personal injury and property damage can result. The manufacturer or seller maintains no liability for the interpretation of this information, nor can it assume any liability in conjunction with its use. When servicing this product, under no circumstances should the original design be modified or altered without permission from LG Electronics. Unauthorized modifications will not only void the warranty, but may lead to property damage or user injury. If wires, screws, clips, straps, nuts, or washers used to complete a ground path are removed for service, they must be returned to their original positions and properly fastened.

CAUTION

To avoid personal injury, disconnect the power before servicing this product. If electrical power is required for diagnosis or test purposes, disconnect the power immediately after performing the necessary checks. Also be aware that many household products present a weight hazard. At least two people should be involved in the installation or servicing of such devices. Failure to consider the weight of an product could result in physical injury.



ESD Notice (Electrostatic Static Discharge)

Today's sophisticated electronics are electrostatic discharge (ESD) sensitive. ESD can weaken or damage the electronics in a manner that renders them inoperative or reduces the time until their next failure. Connect an ESD wrist strap to a ground connection point or unpainted metal in the product. Alternatively, you can touch your finger repeatedly to a ground connection point or unpainted metal in the product. Before removing a replacement part from its package, touch the anti-static bag to a ground connection point or unpainted metal in the product. Handle the electronic control assembly by its edges only. When repackaging a failed electronic control assembly in an anti-static bag, observe these same precautions.

Regulatory Information

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Reorient or relocate the receiving antenna; Increase the separation between the equipment and the receiver; Connect the equipment to an outlet on a different circuit than that to which the receiver is connected; or consult the dealer or an experienced radio/TV technician for help.

LG Contact Information

Customer Service (and Part Sales)	**(800) 243-0000**
Technical Support (and Part Sales)	**(800) 847-7597**
USA Website (GSFS)	**http://gsfs-america.lge.com**
Customer Service Website	**us.lgservice.com**
LG Web Training	**lge.webex.com** ← Presentations with Audio/Video and Screen Marks
LG CS Academy	**lgcsacademy.com** ← **http://136.166.4.200**

LCD-DV:	**32LG40, 32LH30, 37LH55, 42LG60, 42LG70, 42LH20, 42LH40, 42LH50, 42LH90, 42SL80, 47LG90, 47LH85, 47LE8500**
PLASMA:	**42PG20, 42PQ20, 42PQ30, 50PG20, 50PJ350, 50PK750, 50PS80, 50PS60, 60PK750, 60PS11, 60PS60, 60PS80**

Also available on the Plasma Page:
PDP Panel Alignment Handbook, Schematics with Bookmarks
Plasma Control Board ROM Update (Jig required)

New Training Materials on the Learning Academy site

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LG Electronics Alabama, Inc.
201 James Record Road, Huntsville, AL, 35813.



LCD Direct View Overview

Safety and Handling Regulations

1. Approximately 20 minute pre-run time is required before making any picture performance adjustments from the Menu.
2. Refer to the Voltage/Current silk screening on the Switch Mode Power Supply.
3. C-MOS circuits are sensitive to static electricity.
   Use caution when dealing with these IC and circuits.
4. Exercise care when making voltage and waveform checks to prevent costly short circuits from damaging the unit.
5. Be cautious of lost screws and other metal objects to prevent a possible short in the circuitry.

Checking Points to be Considered

1. Check the appearance of the Replacement Panel and Circuit Boards for both physical damage and part number accuracy.
2. Check the model label. Verify model names and board model matches.
3. Check details of defective condition and history. Example: Oscillator failure dead set, etc…

Basic Troubleshooting Steps

Define, Localize, Isolate and Correct

•**Define** Look at the symptom carefully and determine what circuits could be causing the failure. Use your senses Sight, Smell, Touch and Hearing. Look for burned parts and check for possible overheated components. Capacitors will sometimes leak dielectric material and give off a distinct odor. Frequency of power supplies will change with the load, or listen for relay closing etc. Observation of the front Power LED may give some clues.

•**Localize** After carefully checking the symptom and determining the circuits to be checked and after giving a thorough examination using your senses the first check should always be the DC Supply Voltages to those circuits under test. Always confirm the supplies are not only the proper level but be sure they are noise free. If the supplies are missing check the resistance for possible short circuits.

•**Isolate** To further isolate the failure, check for the proper waveforms with the Oscilloscope to make a final determination of the failure. Look for correct Amplitude Phasing and Timing of the signals also check for the proper Duty Cycle of the signals. Sometimes "glitches" or "road bumps" will be an indication of an imminent failure.

•**Correct** The final step is to correct the problem. Be careful of ESD and make sure to check the DC Supplies for proper levels. Make all necessary adjustments and lastly always perform a Safety AC Leakage Test before returning the product back to the Customer.



42LH90 PRODUCT INFORMATION SECTION

This section of the manual will discuss the specifications of the
42LH90
LCD Direct View Display

Key TV Features

- LED Backlight with Local Dimming
- TruMotion 240Hz
- Intelligent Sensor
- Full HD 1080p
- 2,000,000:1 Contrast Ratio
- 2.4ms Response Time
- 500 cd/m² Brightness
- Wide Color gamut
- Super IPS Panel
- XD Engine
- 24fps Real Cinema
- ISFccc Ready
- Picture Wizard
- AV Mode II (Cinema, Sports, Game)
- NTSC / ATSC / Clear QAM

- Audio Output Power 10W x 2
- Invisible Speaker system
- Clear Voice II
- SRS TruSurround XT™
- Smart Volume Controller
- Dolby® Digital 5.1 Decoder
- Backlight Control
- Video Mute
- ENERGY STAR® 3.0 Compliant
- 4 HDMI™ v1.3 with Deep Color
- SIMPLINK™ Connectivity
- 2 HD Component Video Inputs
- 2 Composite inputs
- 1 Digital Audio Out
- USB 2.0 (JPEG, MP3, MP4, Divx)
- PC Connectivity (D-Sub 15pin)
- RF Antenna Input

Basic Specifications (LOGO Familiarization)



Full HD 1080p Resolution
Displays HDTV programs in full 1920 x 1080p resolution for a more detailed picture.





















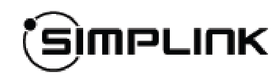


















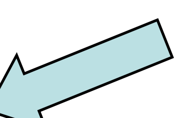


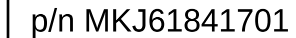


Remote Control Familiarization

TOP PORTION

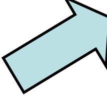


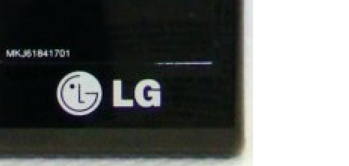




BOTTOM PORTION















Accessing the Service Menu

To access the Service Menu.

1) **You must have the Service Remote. p/n 105-201M**
2) **Press "In-Start"**
3) **A Password screen appears.**

Note: A Password is required to enter the Service Menu.
Enter; **0000**

TV Rear Input / Output Jacks

USB Port
Software Upgrades
Music, Photos

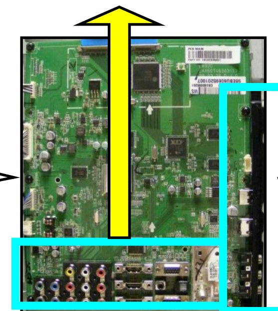
Side In/Out

Rear In/Out Jacks



USB IN
HDMI IN 4
VIDEO L/MONO-AUDIO-R
AV IN 2

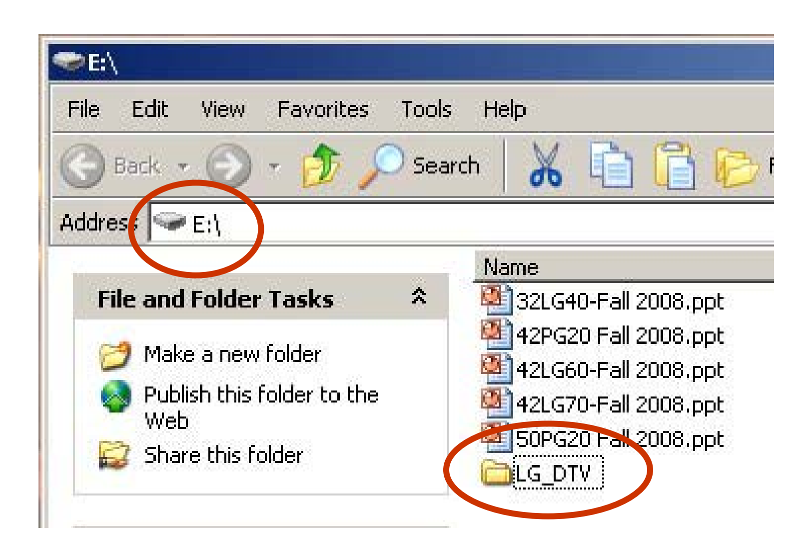
MAIN BOARD
Rear and Side
Input/Output locations



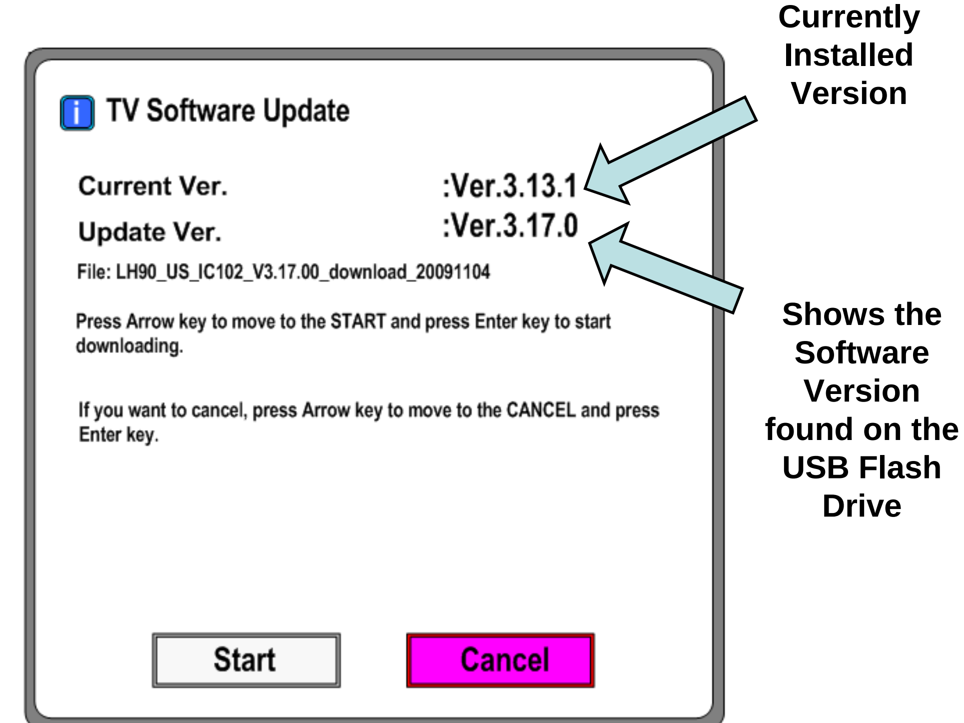


Software Download

1) Create an LG_DTV folder on the USB Flash Drive

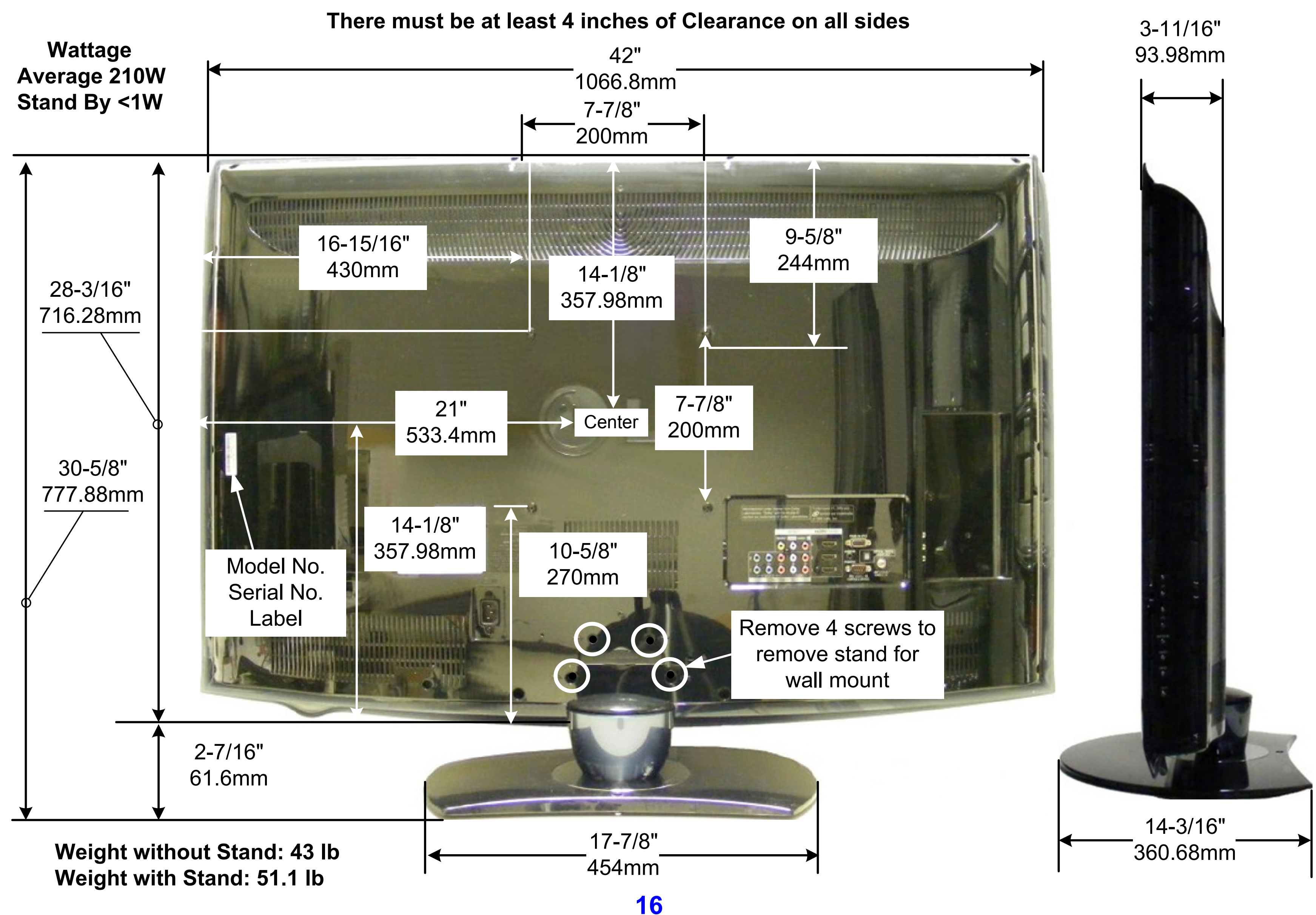


2) Copy new software (xxx.epk) to "LG_DTV" folder. Make sure to have correct software file.
3) With TV turned on, insert USB flash drive.
4) You can see the message "TV Software Upgrade" (See figure to right)
5) Cursor left and highlight "START" Button and push "Enter" button using the remote control.
6) You can see the download progress Bar.
7) Do not unplug until unit has automatically restarted.
8) When download is completed, you will see "COMPLETE".
9) Your TV will be restarted automatically.



*** CAUTION:**
Do not remove AC power or the USB Flash Drive. Do not turn off Power, during the upgrade process.

42LH90 Product Dimensions



Disassembly:

This section of the manual will discuss Disassembly, Layout (Circuit Board Identification) of the 42LH90 LCD Direct View Television.

Upon completion of this section the Technician will have a better understanding of the disassembly procedures, the layout of the printed circuit boards and be able to identify each board.



Removing the Back Cover

Remove the 23 screws indicated.
Pay attention to the size and type of screw as there are many different types.
Putting in an improper screw when reassembling may Cause damage.

Decorative Plastic Cap (if used) must be removed.

Bottom two screws do not have to be removed.

The Stand does not need to be removed before removing the back.

Circuit Board Layout

TFT Panel
EAJ60694101

T-CON board
p/n EAT60665101

INVERTER
p/n EAY60702001

LVDS Cables

POWER SUPPLY
p/n EAY58584001

p/n EAD60679428

p/n EAD60679364

Left LED Connection

Right LED Connection

Main Board
p/n EBR62151101

Side Keys

Side Inputs

Intelligent Sensor / IR

AC Input

Rear Inputs

Tweeter R

Power Button

Moving LED

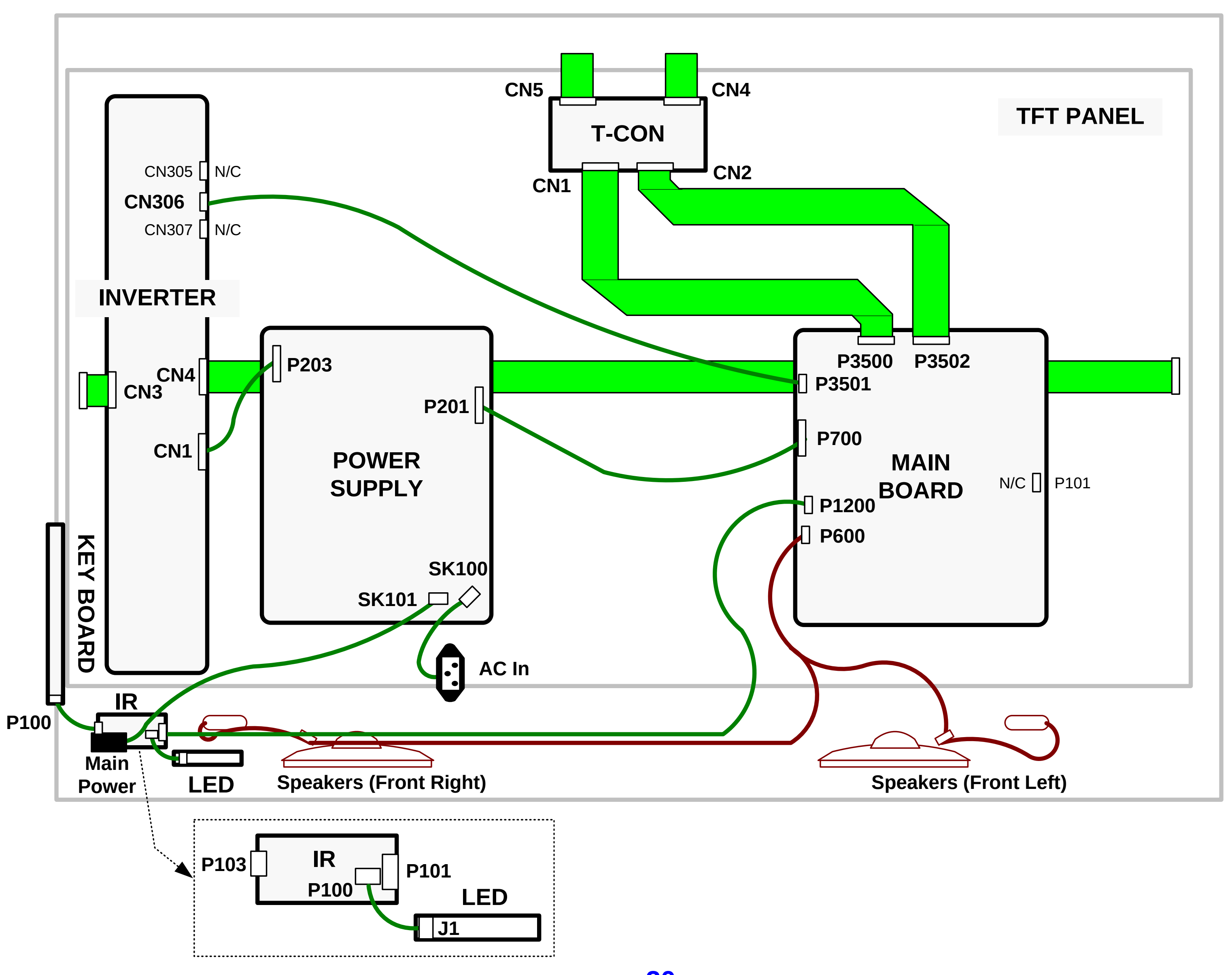
Full Range Speaker R

p/n EAB58534501

Full Range Speaker L

Tweeter L
p/n EAB58536001

42LH90 Connector Identification Diagram



Power Supply Board Removal

1

Disconnect P201, P203, AC In SK100 and SK101.

2

Remove the 6 screws indicated by the arrows.

P203

P201

SK100

SK101

Power Switch

AC In

P201

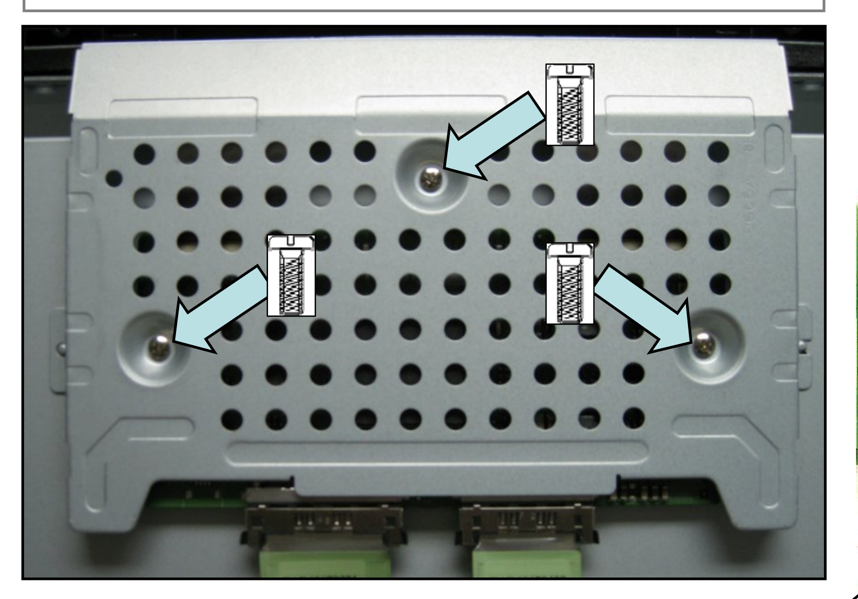
Press in Two tabs to release lock



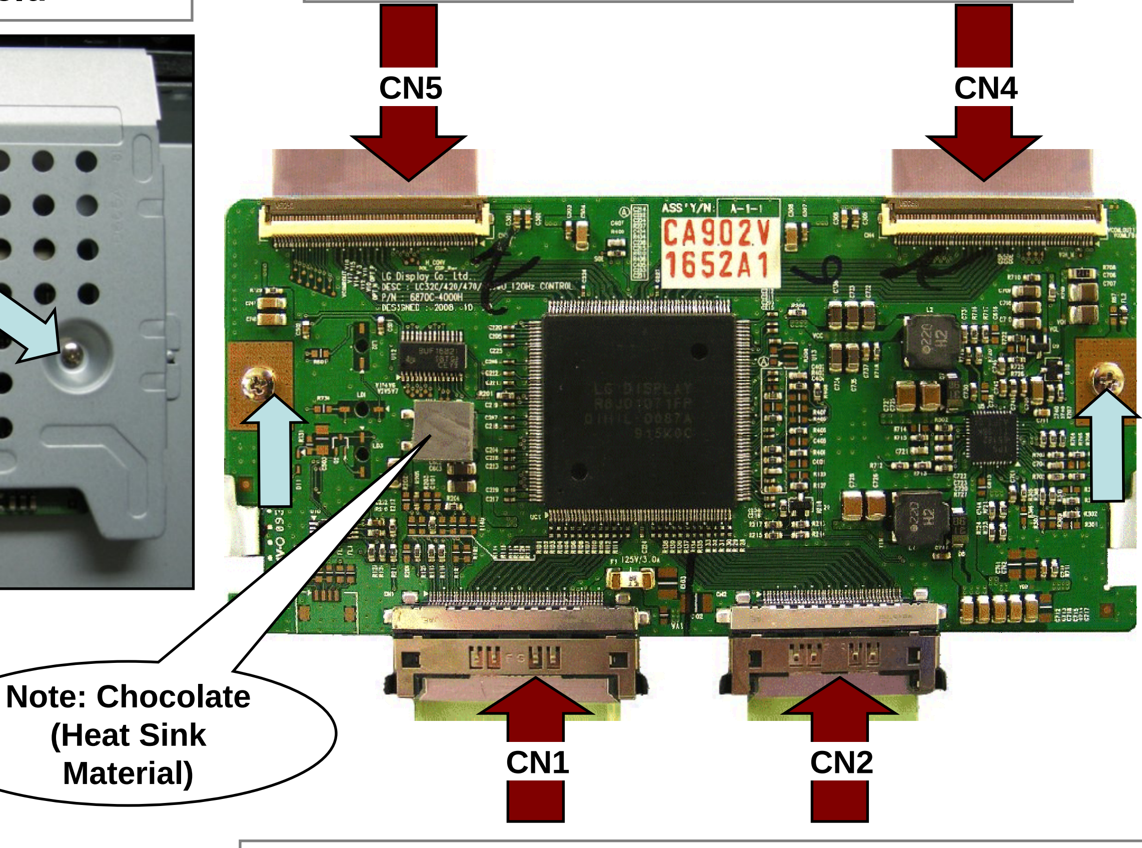
T-CON Board Removal

STEP (1)

Remove the 3 Screws in the T-CON shield and remove the shield



The two screws shown in the picture below are for the Service Position. They would have been removed when removing the shield. Be sure to reinstall them if servicing the T-CON Board.



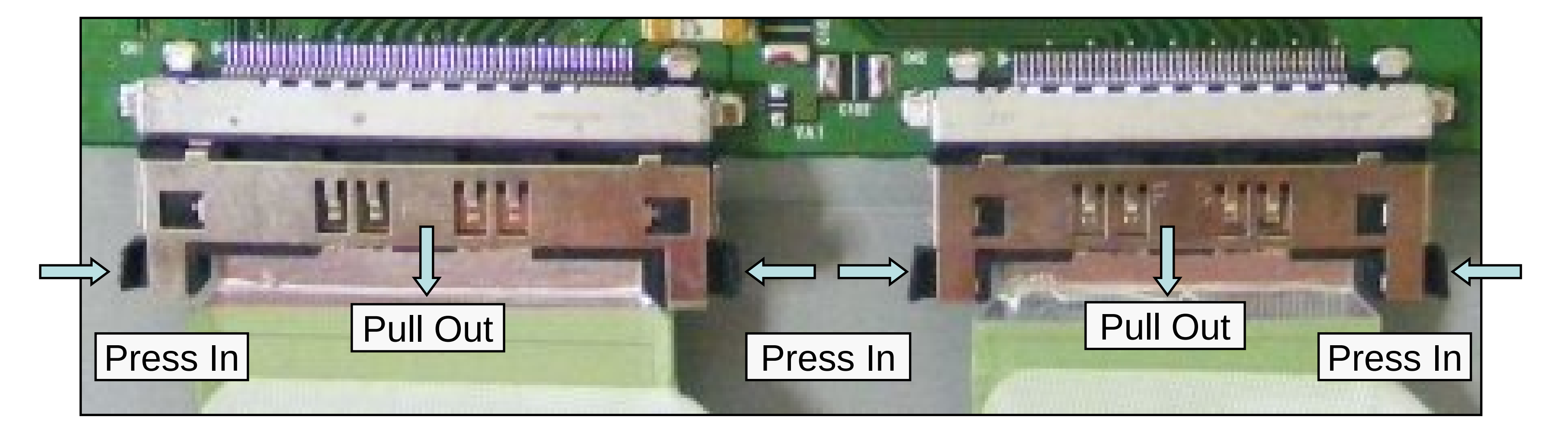
STEP (2)

Disconnect CN1, CN2, CN4 and CN5.
See next slide for details about removing cables.



T-CON Board Removal Board Continued (Unlocking CN1 and CN2 LVDS Cables)

(CN1) LVDS **(CN2) LVDS**

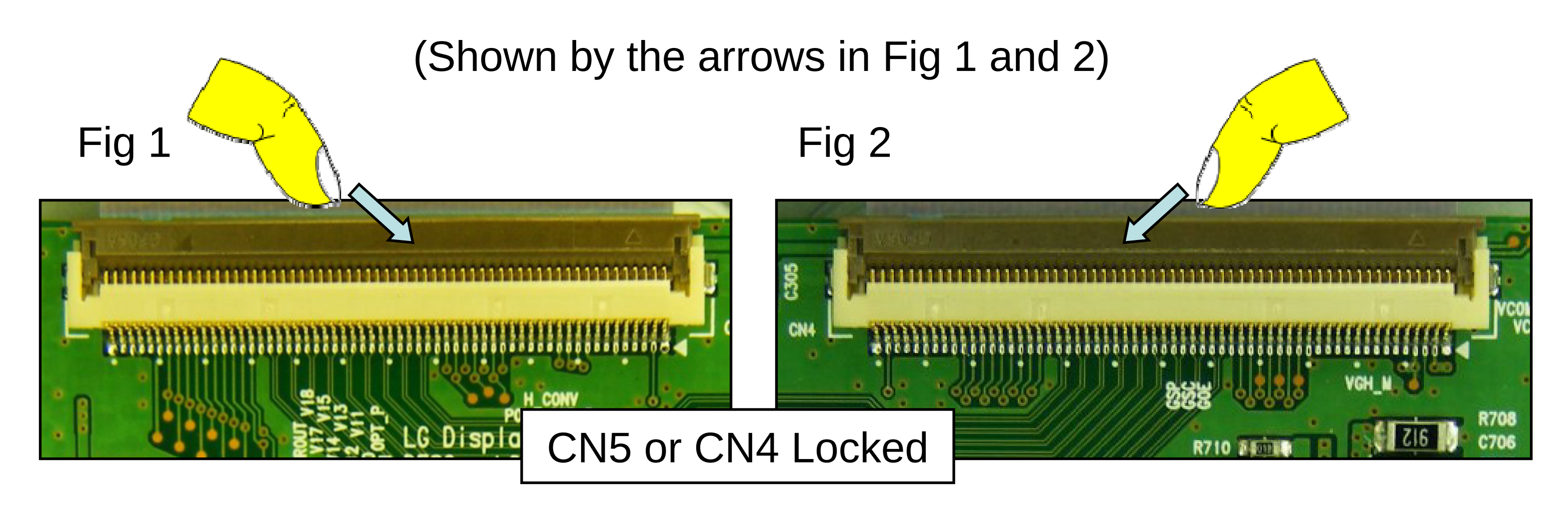


To remove the LVDS cables CN1 and CN2;
Press in on the two tabs and slowly rock the cable out of the connector.
(Shown by the arrows in Figure above)

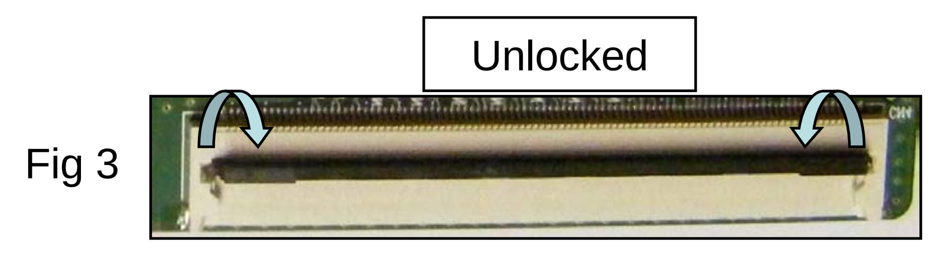
Note: The tabs are fragile, use caution, they may break.

T-CON Board Removal Board Continued (Unlocking CN4 and CN5 LVDS Cables)

To remove the flex cables to the TFT Panel, CN4 or CN5, place a soft thin object like a fingernail underneath the black locking tab and gently pull forward.



Flip the lock up and back from the flex cable.
Then the flex cable can be easily removed.



The locking tab is flipped down

Removing the Main Board

1

Disconnect P3500, P3501, P3502, P1200, P700 and P600

2

Remove any tape holding down any cables. Remove the 6 screws indicated by the arrows.

3

Remove decorative plastic and remove the board.

NOTE: Always check on top and behind the Large ICs. And look for a piece of Chocolate (Heat Transfer Material). Be sure to transfer to new Board if present.

Flip the locking tab upward, pull the LVDS ribbon out.

P3500

P3502

P3501

P700

P1200

P600

Press in on the top and bottom release tabs to remove.

n/c

n/c

Decorative Plastic (See a and b)

(b) Lift Out Pull Down

(a) Slide Right

Removing the Inverter Board



Remove the 8 screws indicated by the arrows. Remove the Inverter Shield.

Use caution, do not allow screws to fall.

2

Disconnect CN1, CN3, CN4 and CN306. Remove the Inverter.

NOTE: Always check for Chocolate (Heat Transfer Material). Be sure to transfer to new Board if present and replace in the correct position. There should be 8 pieces on the DC to DC converter coils near the bottom right.

NOTE: If Servicing the Board, return the screws into the board to provide stability and grounding.

CN306

CN3

CN4

CN1

Inverter

Chocolate

Removing the Inverter Board (Chocolate Notice) Back Side of the Board

On the back side of the Inverter are 5 pieces of Chocolate, (Heat Transfer and Noise reduction pads). Be sure to replace these on the New Inverter if the board is replaced.

Be sure they do not fall off if the Inverter is removed.

Chocolate

Chocolate Close Up

Chocolate Location White Box Outline



Removing Front Boards (IR Board and Moving LED Board)

2 **Disconnect P101 and P102.**
Note P102 is behind the Power Switch.
Remove the IR board by removing the 1 screw and lift out the board.

p/n EBR62127501

Key board

p/n EBR62128101

P100

IR board / Intelligent Sensor

P101

P102

Tab

P100

Tab

J1

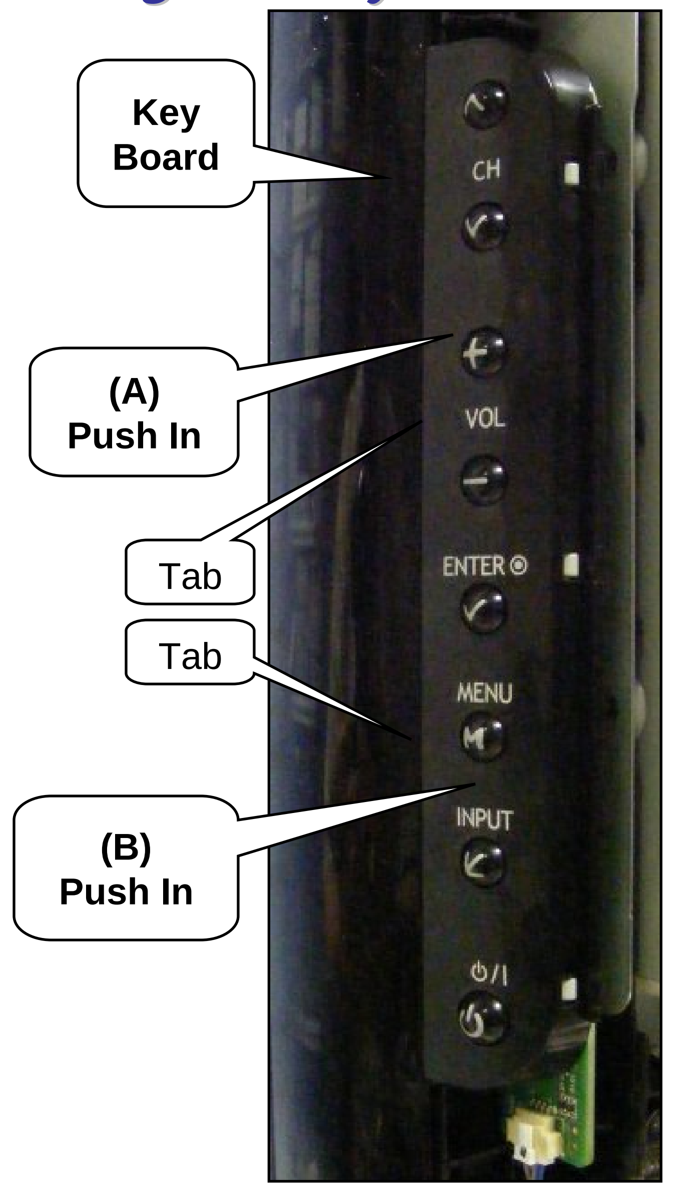
Moving LED board (Power LEDs)

p/n EBR61674001

The Power Switch has been removed for easier viewing of connectors and screws.

1 **Disconnect J1 or P100. Remove the LED board by lifting up on the two locking tabs and pull backwards on the board.**

Removing Front Key Board



1

To Remove the Key Board, Apply Pressure at point (A) on the Key Board itself while using an object to slightly pry out from the top.

2

Apply Pressure at point (B) on the Key Board itself while using an object to slightly pry out from the bottom.

p/n EBR62127501

Tab Slots

Tab Slots

CH

VOL

ENTER

MENU

INPUT

P100

3

Disconnect P100 and remove the Key Board

Troubleshooting:

This section of the manual will also discuss troubleshooting.

Upon completion of this section the Technician will have a better understanding of how to diagnosis and resolve problems.



POWER SUPPLY SECTION

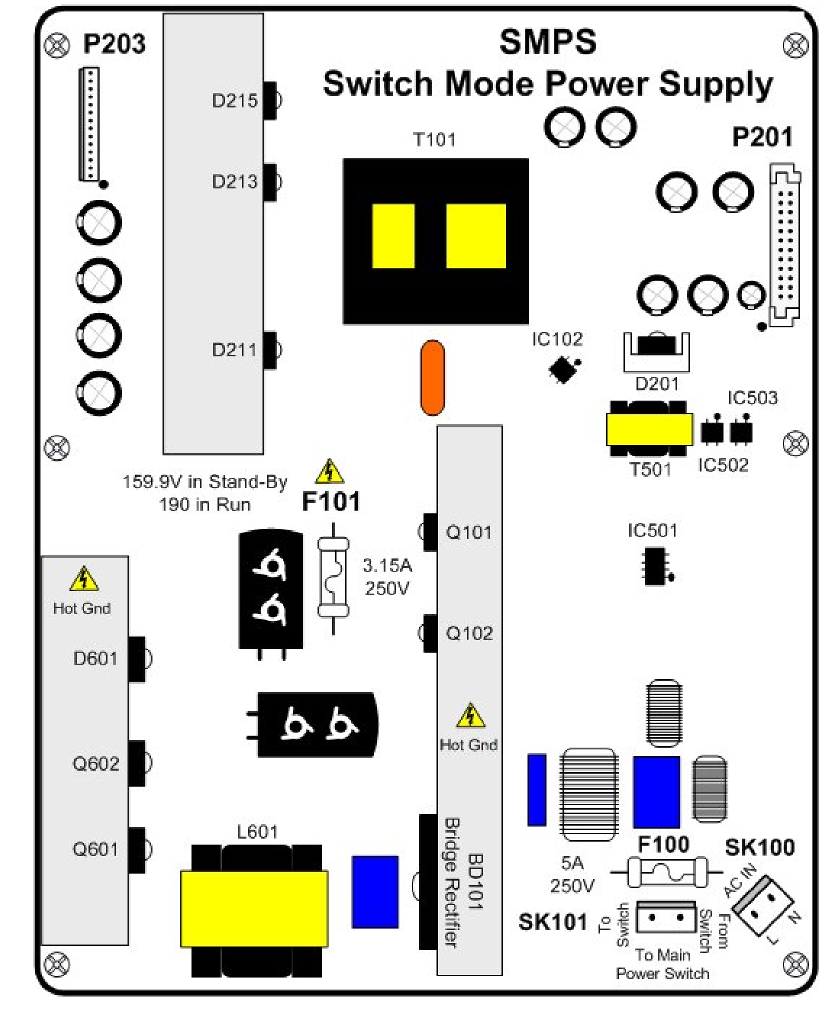
This switch mode power supply develops Stand By 5V at all times when AC is applied.
At power on, it develops 12V and 24V for the Main board
And 24V for the Inverter.

This power supply draws a little less that 1 watt during stand by mode. The fuse F101 reads 159.9V (from hot ground) during this time.

When the controller chip (IC501) receives the PWR-ON command via P201 Pin 19, the primary section increases its current supplying ability.
The Primary fuse F101 now reads 390V.

P201 Connector: (To Main Board)
12V is routed out P201 pins 5 and 6 and
24V is routed out P201 pins 1 and 2.

P203 Connector: (To Inverter Board)
24V is routed out P203 pins 1 through 5.



Power Supply (Main Power Switch Type 1) Location

There are three types of Main Power switch used in LG televisions.

Type 1: Shuts off AC to the Power Supply.

Type 2: Opens ground to the front IR board. (Stand-By 5V Remains, the Main board stays alive).

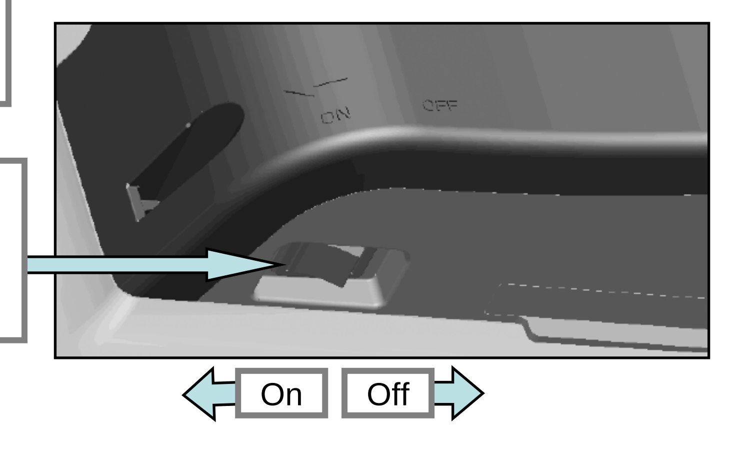
This prevents any activity of the IR or the Key Board. When the Switch is opened, a line called Power Key pulls up high when ground opens. When the switch is closed, this same line called Power Key feeds back to the Microprocessor and the Micro. Turns on the Power.

Type 3: Opens ground to the front IR board. (Stand-By 5V turns off, the Main board is dead).

This prevents any activity of the IR or the Key Board. When the Switch is opened, a line called Power Key pulls up high when ground opens. This line feeds back to the Main board and from there it routes to the Power Supply. The high tells the Controller chip to turn off STBY-5V. When the switch is closed, this same line called Power Key now goes high and feeds back to the Power Supply and tells the controller chip to turn STBY-5V on.

If the TV won't come on, be sure to check the Main Power Switch before assuming a failure has occurred. This switch breaks AC to the SMPS.

MAIN POWER SWITCH LOCATION
TYPE 1
(Bottom Left Side viewed from rear)



Power Supply (SMPS) Board Layout

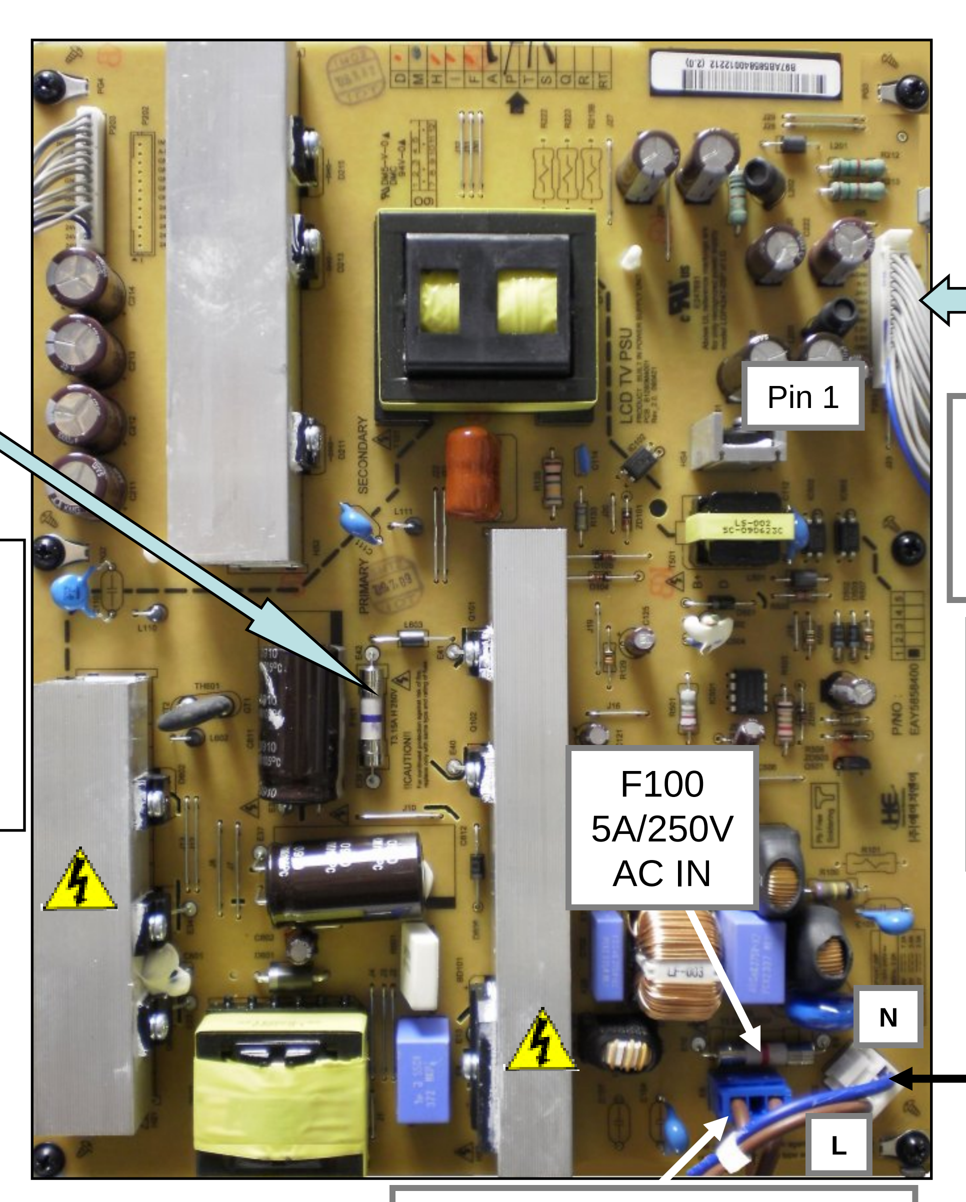
F101
3.15A/250V
Run 390V
STBY 159.8V
From Hot Gnd

F101 (Diode Check)

Red Lead on Fuse (Open)
Black Lead on Hot Ground

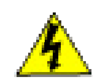
Black Lead on Fuse (0.608V)
Red Lead on Hot Ground

The Left pin on **SK101** goes to the Main Power Switch. The Right hand pin returns from the Main Power Switch.



To Main
P201

Components Inside the dashed line are Hot Gnd



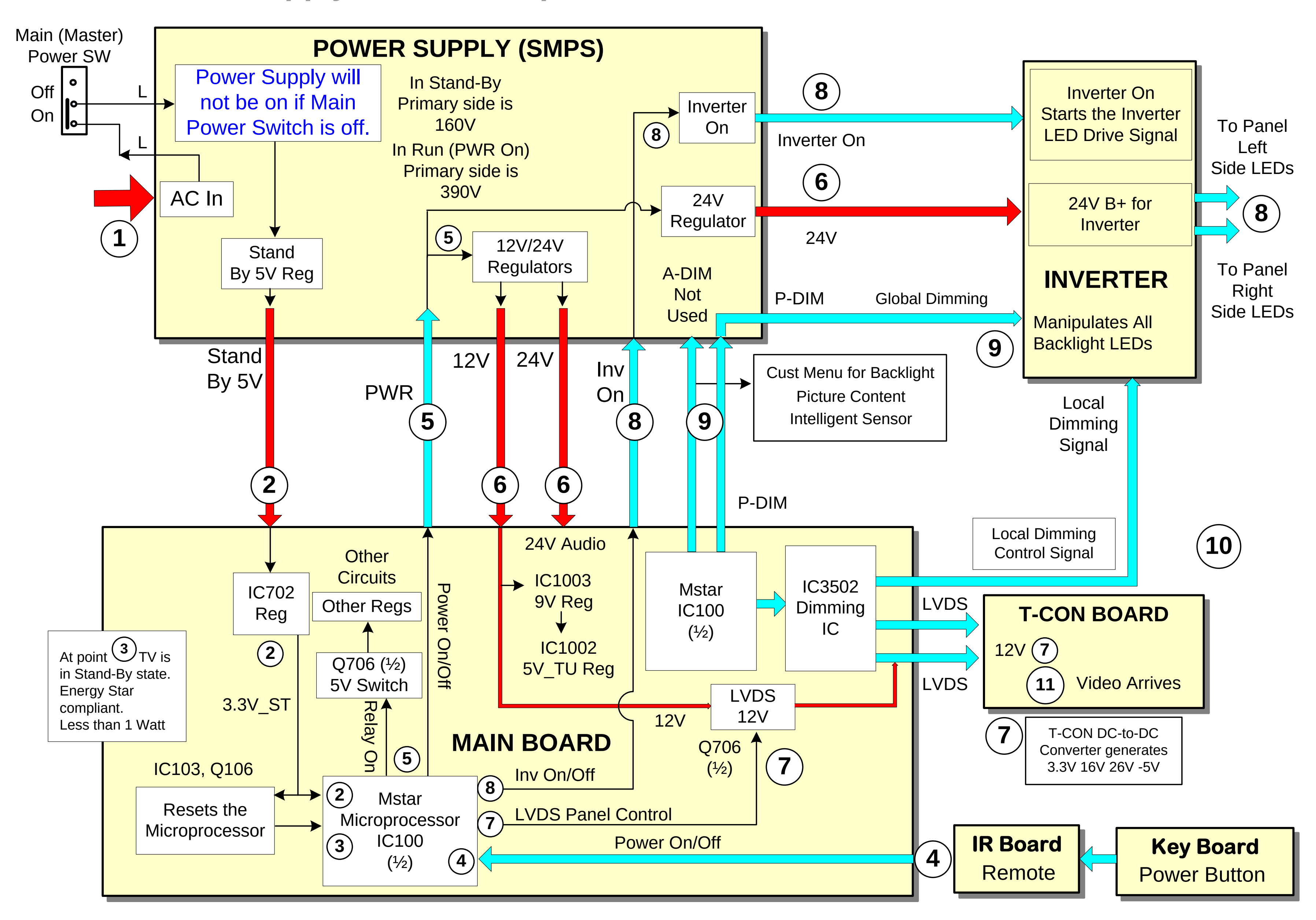
Hot Ground Shock Hazard

AC IN
SK101

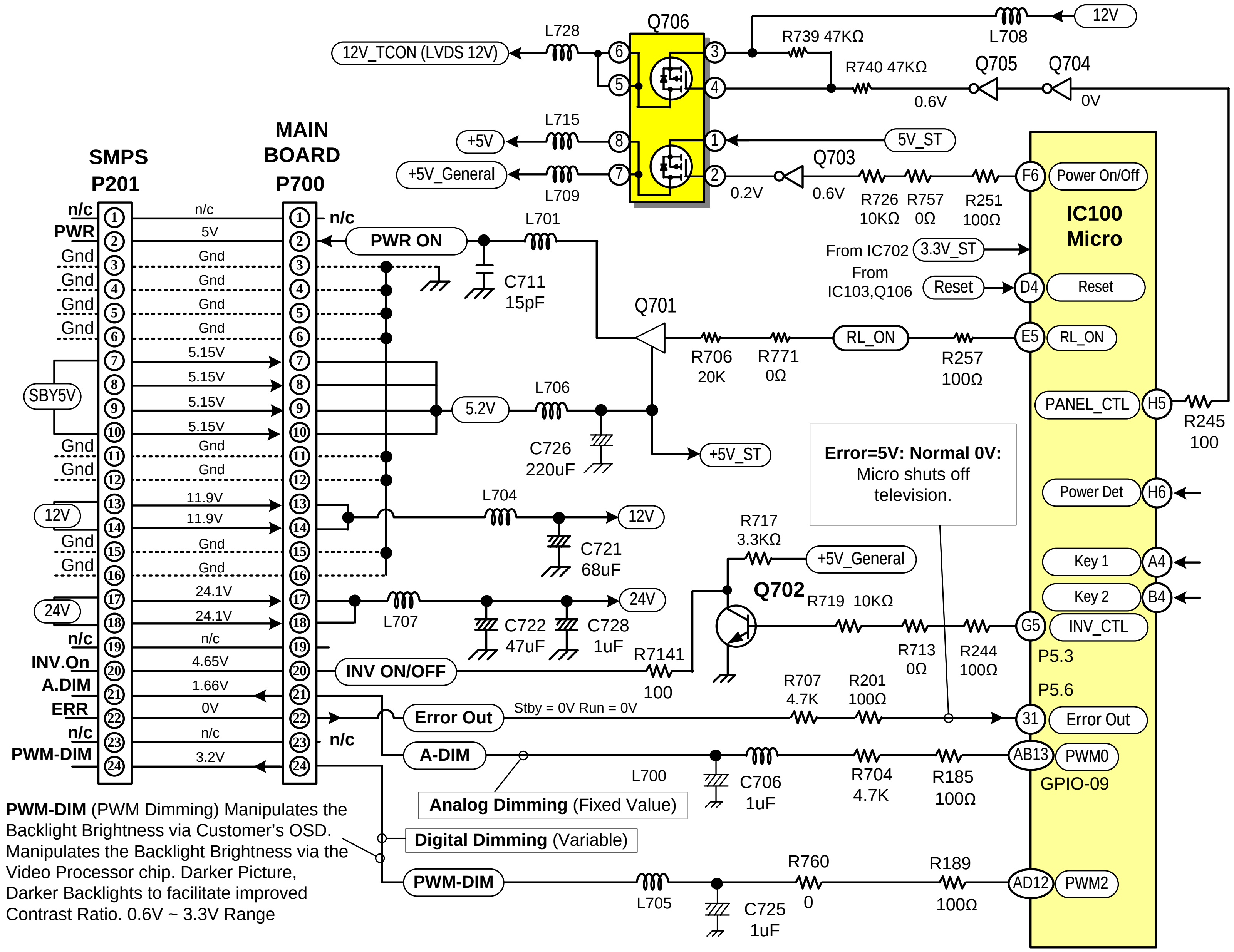
To Master Power Switch
SK101



42LH90 Power Supply Turn On Sequence



42LH90 P700 on Main Board to SMPS Turn On Circuit



PWM-DIM (PWM Dimming) Manipulates the Backlight Brightness via Customer's OSD. Manipulates the Backlight Brightness via the Video Processor chip. Darker Picture, Darker Backlights to facilitate improved Contrast Ratio. 0.6V ~ 3.3V Range

Power Supply Board Low Voltage Test 1

AC Should not be applied at any time while adding resistors or while unplugging connectors as damage to the circuit Board may occur.

a) When AC is applied, the SMPS "MUST" be producing STBY 5V on pins 7, 8, 9 or 10 of P201.

If 5V Standby is not being generated, the SMPS is defective and must be replaced. There is no need to continue with the next test. But, make sure the Main Power Switch is On.

(b) Unplug P700 on the Main Board to make insertion of the Resistors much easier.

No Backlights during this test

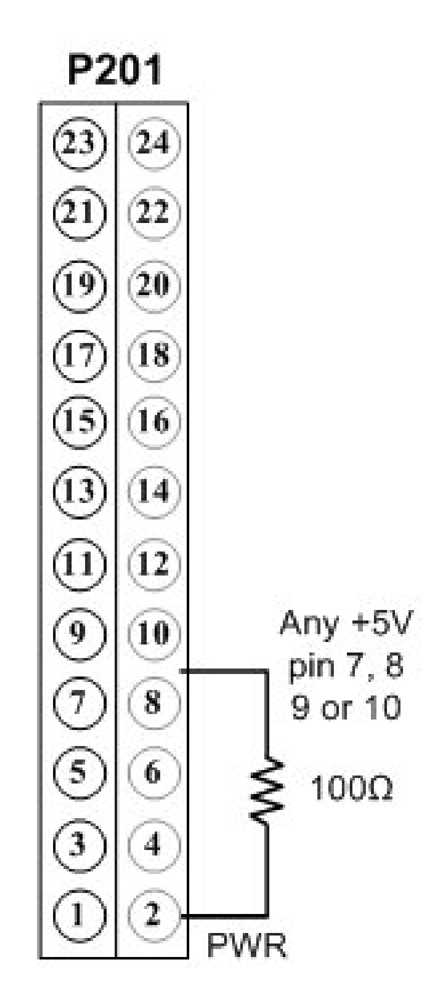
TEST 1:

(1) Add a 100Ω resistor between (5V STBY) pin 7, 8, 9 or 10 and Pin 2 (PWR). Apply AC. This will turn on the power supply.

a) **Check that the 24V and 12V power supplies are turned on,**

- **P201 (24V pins 17 and 18)**
- **P201 (12V pins 13 and 14)**
- **P203 (24V pins 1 through 5) to the Inverter.**

(2) Remove AC power.



Use P700 Side to insert resistors

Power Supply Board Backlights Test 2

P700 Connector disconnected from the Main Board. Apply AC after adding jumper.

Continue if the 1st test was OK. Leave original resistor in place.

(3) Add another 100Ω resistor between (5V) pin 7, 8, 9 or 10 and Pin 20 (INV On).

(4) Apply AC Power. Simulating a Power and Backlight On command.

Backlights Normal:

a) If normal, the backlights should turn on. SMPS OK, Inverter OK.

Backlights Abnormal:

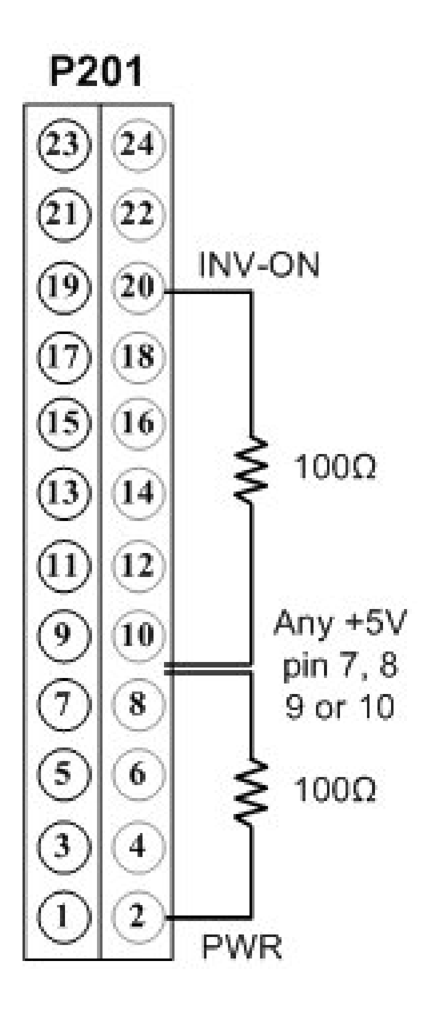
a) Recheck all connections.

b) Confirm the INV On/Off line pulling up to at least 3V.

REMOVE AC POWER:

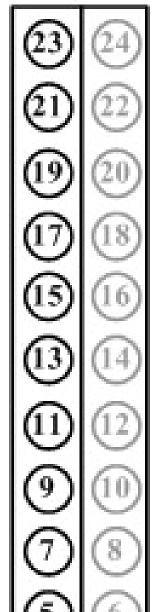
c) Check the connections to the Inverter.

If the 24V was arriving at the Inverter in Test 1 (pins 1~5 of P203) and the Inverter On command (INV-ON pin 12 of P203) is arriving, then see Inverter Section for further testing.



Use P700 Side to insert resistors

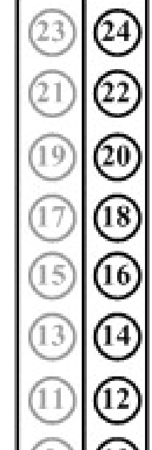
Power Supply Connector P201 Voltage and Diode Check

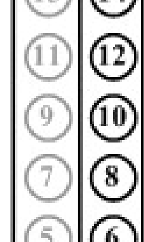
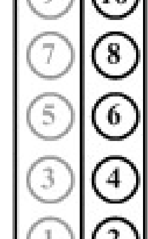


P201 Odd "SMPS" to P601 "Main"

Pin	Label	STBY	Run	Diode Check
23	nc	nc	nc	Open
21	[1]A.DIM	0.47V	1.66V	Open
19	nc	nc	nc	Open
17	24V	0V	24.1V	0.74V
15	Gnd	Gnd	Gnd	Gnd
13	12V	0V	11.9V	0.98V
11	Gnd	Gnd	Gnd	Gnd
9	5.2V	5.15V	5.15V	Open
7	5.2V	5.15V	5.15V	Open
5	Gnd	Gnd	Gnd	Gnd
3	Gnd	Gnd	Gnd	Gnd
1	nc	nc	nc	Open

[1]ADIM Pin 21 Fixed and not used



P201 Even "SMPS" to P601 "Main"

Pin	Label	STBY	Run	Diode Check
24	[2]PDIM	0V	3.2V	Open
22	Err Out	0V	0V	Open
20	INV.ON	0V	4.65V	Open
18	24V	0V	24.1V	0.74V
16	Gnd	Gnd	Gnd	Gnd
14	12V	0V	11.9V	0.98V
12	Gnd	Gnd	Gnd	Gnd
10	5.2V	5.15V	5.15V	Open
8	5.2V	5.15V	5.15V	Open
6	Gnd	Gnd	Gnd	Gnd
4	Gnd	Gnd	Gnd	Gnd
2	PWR	0V	5.0V	1.6V

[2]PDIM Pin 24 can vary according to type of signal being processed and the OSD Backlight setting. 0.33V 0% to 3.3V 100%. Output from the Video Processor IC100.

Diode Mode values taken with all Connectors Removed



Power Supply Connector P203 Voltage and Diode Check



P203 "SMPS" to CN4 "Inverter"

Pin	Label	STBY	Run	Diode Check
14	ERR	0V	0V	Open
13	[2]P-DIM	0V	3.2V*	Open
13	INV_ON	0V	4.65V	Open
11	[1]A.DIM	0.47V	1.66V	Open
6~10	Gnd	Gnd	Gnd	Gnd
1~5	24V	0V	24.0V	0.74V

[1]ADIM Pin 11 Fixed and not used

[2]P-DIM Pin 24 can vary according to type of signal being processed and the OSD Backlight setting.

*0.6V 0% to 3.3V 100%. Output from the Video Processor IC100.

Diode Mode values taken with all Connectors Removed



Power Supply Connector SK100 and SK101 Voltage and Diode Check

Diode Mode values taken with all Connectors Removed

SK100 "SMPS" to AC IN

Pin	Label	STBY	Run	Diode Check
E3	L	120Vac		OL
E7	N			OL

AC Voltage Readings (From Hot Ground)
Pins 1 and 2 for STBY and RUN.

SK101 "SMPS" to MASTER POWER SWITCH

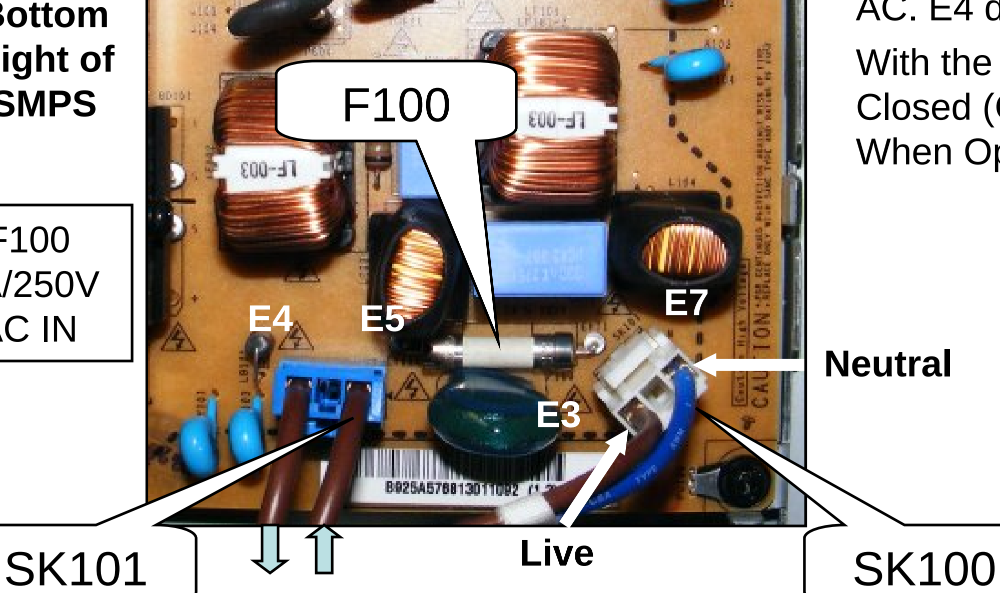
Pin	Label	STBY	Run	Diode Check
E4	n/a	120Vac		OL
E5	n/a			OL

AC Voltage Readings for either pin 1 or pin 2 in STBY and RUN with one lead on Neutral of SK100. (Reading from Hot Ground)
Note: With Main Power Switch Open, E5 has no AC. E4 does have AC.

With the Master Power Switch Closed (On) AC flows.
When Open (Off) AC open and does not flow.

Bottom Right of SMPS

F100
8A/250V
AC IN



F100 (Diode Check)
Main Power Switch Closed

Red Lead on Fuse (Open)
Black Lead on Hot Ground

Black Lead on Fuse (0.525V)
Red Lead on Hot Ground

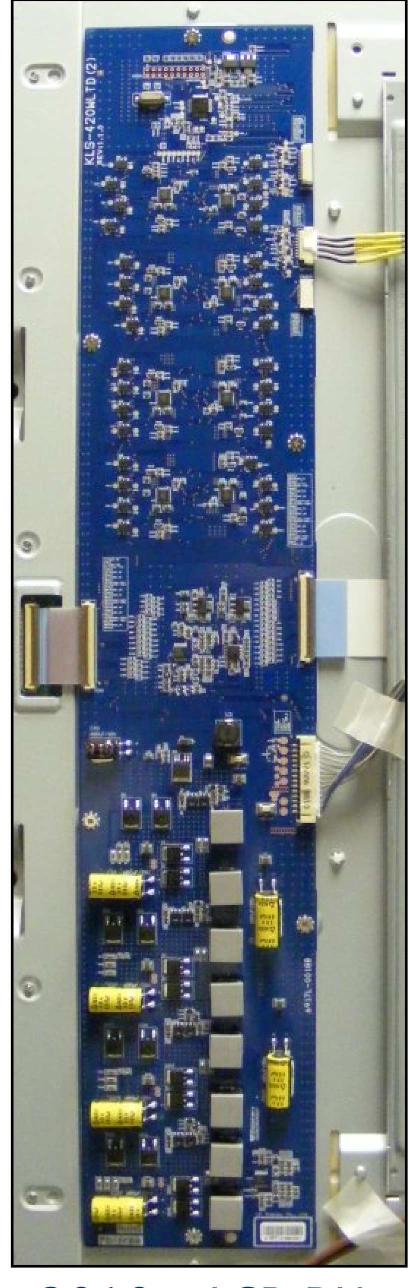
INVERTER (LED BACKLIGHTS) SECTION

The Inverter receives 24V from the SMPS on CN1 pins 1~5..
The Inverter On (INV ON) command from CN1 pin 12 starts the Inverter drive signals.
P-DIM is delivered from the Main board through the SMPS to the Inverter on CN1 pin 13.
The Inverter is responsible for delivering B+ (27.5V) to each of the 64 LED Blocks. This is accomplished by 4 DC to DC Converters (M1~M4) on the board, (easily identified by the 4 yellow capacitors on the lower left of the board.

- M1 and M3 are routed out CN4
- M2 and M4 are routed out CN3.

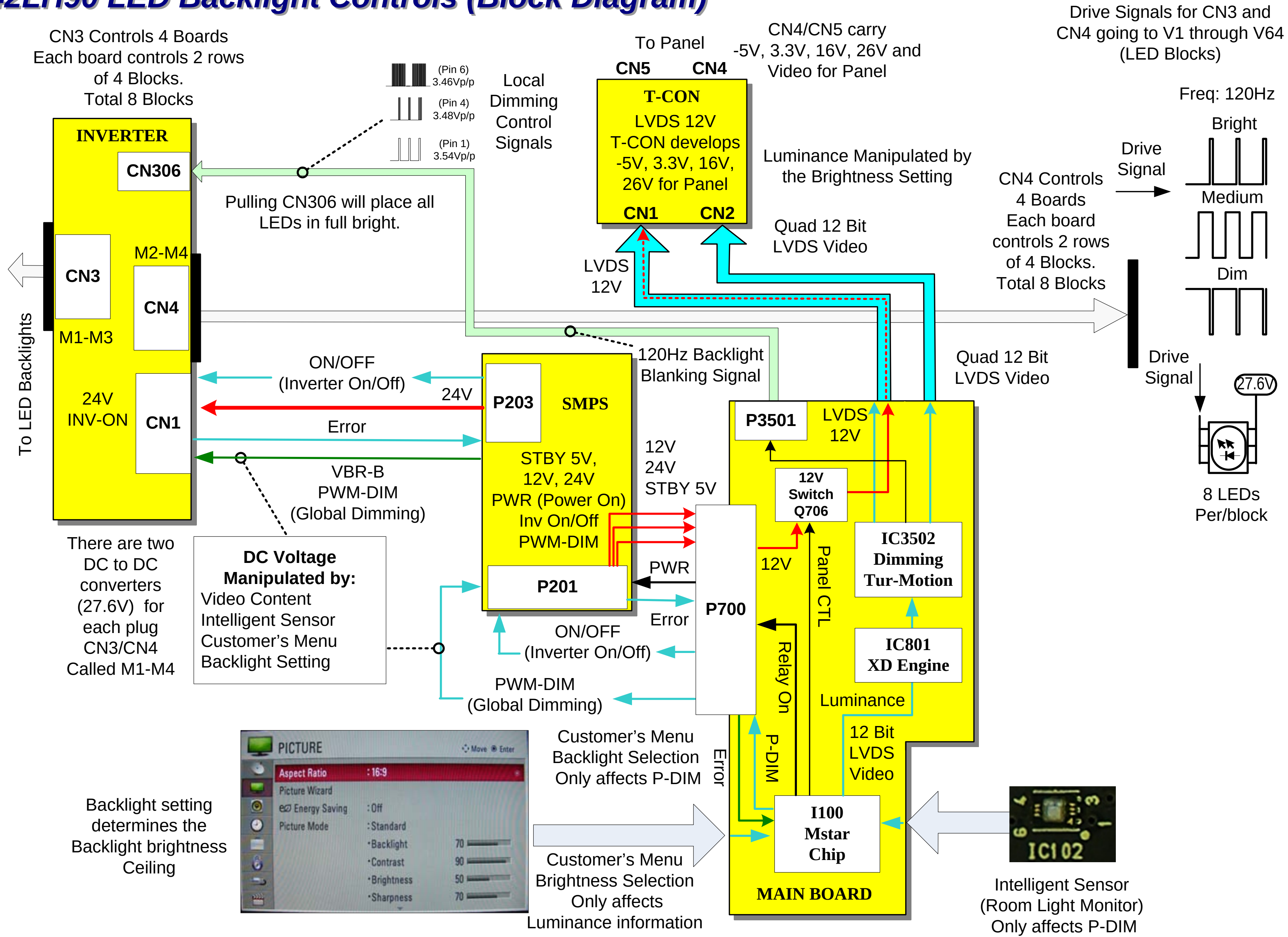
It also must deliver grounding pulses (Drive Signals) to each of the 64 LED Blocks. This is accomplished by the 32 switching components Q19~Q50 each controlling 2 blocks.

The Left hand connector CN3 connects the 4 LED Boards (32 blocks) on the right side of the screen and the Right hand connector CN4 connects to the 4 LED Boards (32 blocks) on the left.





42LH90 LED Backlight Controls (Block Diagram)



Inverter Connector Identification

CN305 n/c

CN306

CN307 n/c

CN3

CN4

CN1

Chocolate

M1

M2

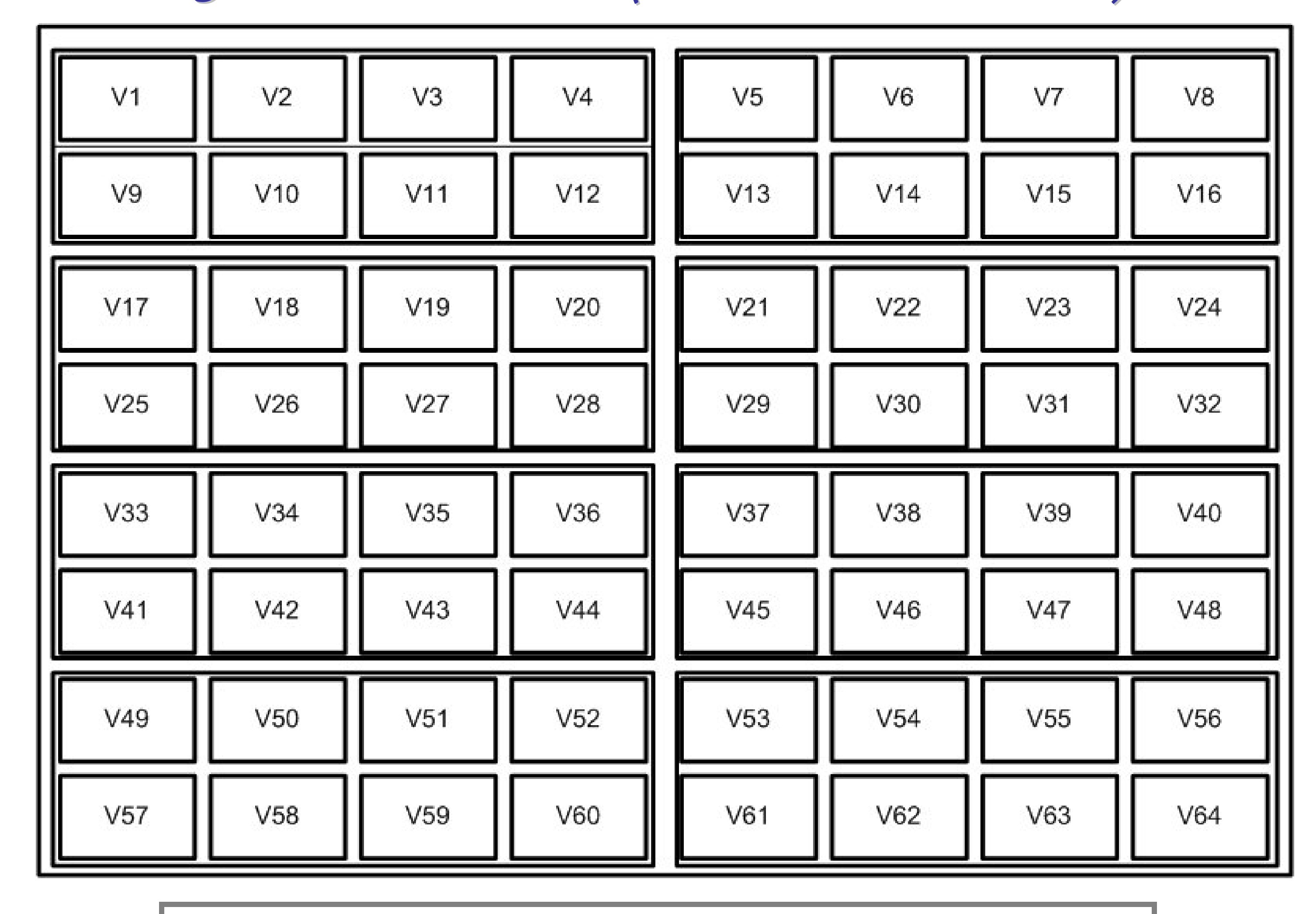
M3

M4

27.5V
Power
Supplies



General LED Backlight Board Information (As viewed from the Front)



There are 4 LED Boards per/side, 8 Total.
There are 2 Rows of LED blocks per/board.
There are 4 LED blocks per/row.

General LED Backlight Block Information

9.4V p/p
120 Hz

Driver Pulse Provides Ground

The longer the pulse stays low the brighter the LED Block.

8 LEDs Per/Block

27V

Connected to CN3 or CN4

There are 8 LEDs per/block.
There are a total of 512 LEDs.

LED Backlight Basics (LED Layout)

The picture below shows a close up of one of the 512 individual LEDs contained within the backlight boards. There are two sides each with 256 LEDs (32 blocks) in each side.
An individual block is manipulated by the Main board Dimming IC IC3502 in accordance with the video intensity at the specific location of the block of LEDs for that video content (Local Dimming). In other words, if the video is dark in the area of the screen that is being illuminated by a block of LEDs, they will be dimmed.

Also, all blocks are manipulated simultaneously via (Global Dimming) by IC100 Video Processor. The Overall intensity of the backlights is manipulated by the "Global Dimming" signal from the Mstar (IC100) chip called Digital-Dimming (PWM-DIM).

A minimum of 21V required to light all 8 LEDs in a block
Pins 1,2,13,14,16,17,28,29,31,32,43,44,46,47,58,59
On CN3 and CN4

Panel Disassembly required. (Not during warranty period.) A simple Forward Bias diode check will cause the diode to illuminate if it is good. Check any pin on the right to any pin on the left.

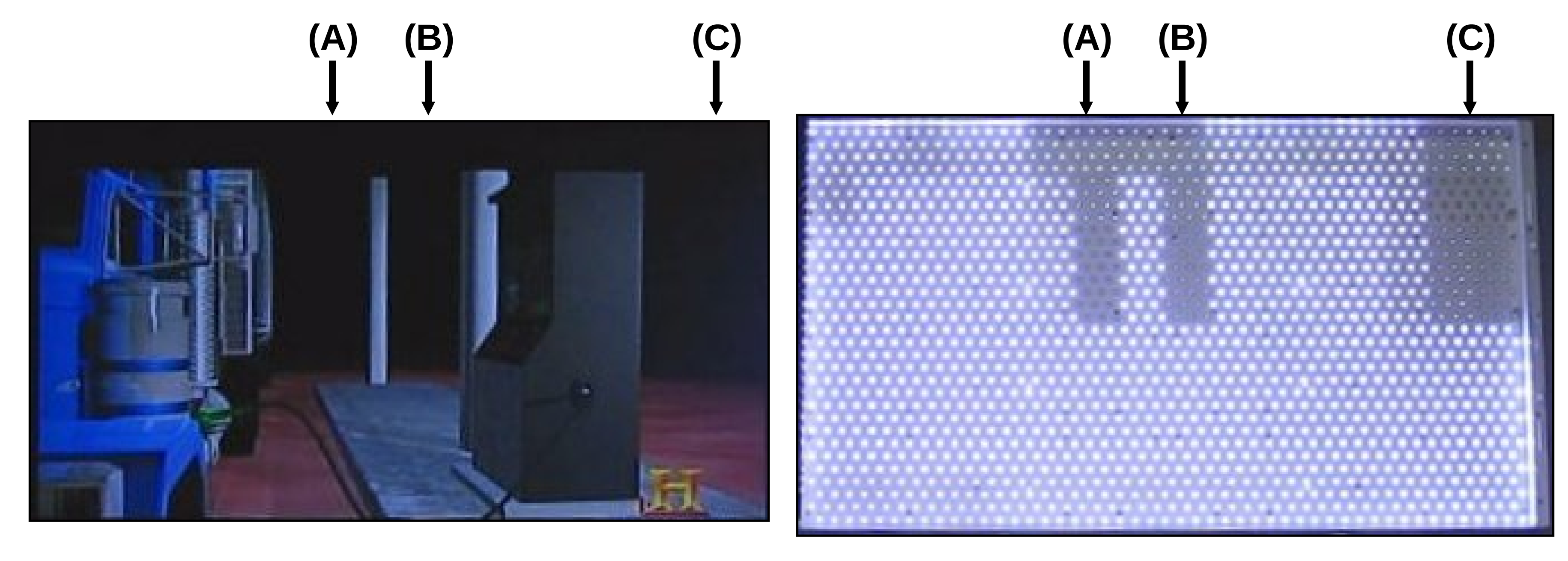
This represents One Block.
There are 4 boards per/side.
Each board contains 8 Blocks.
Totaling 32 Blocks per/side.
64 Blocks over all.

In the Diode Mode Check, the LED will light. (2.6V Reading)

LED Backlight Basics (Local Dimming)

The graphics below show the relationship between the LEDs reaction to real time video on the screen, this is called “Local Dimming”.

The areas in the picture on the left shown by A, B, C and D show the dark areas of the screen. The picture on the right shows the backlight LEDs. Note they are dimmed out in the same area as the dark video on the left.

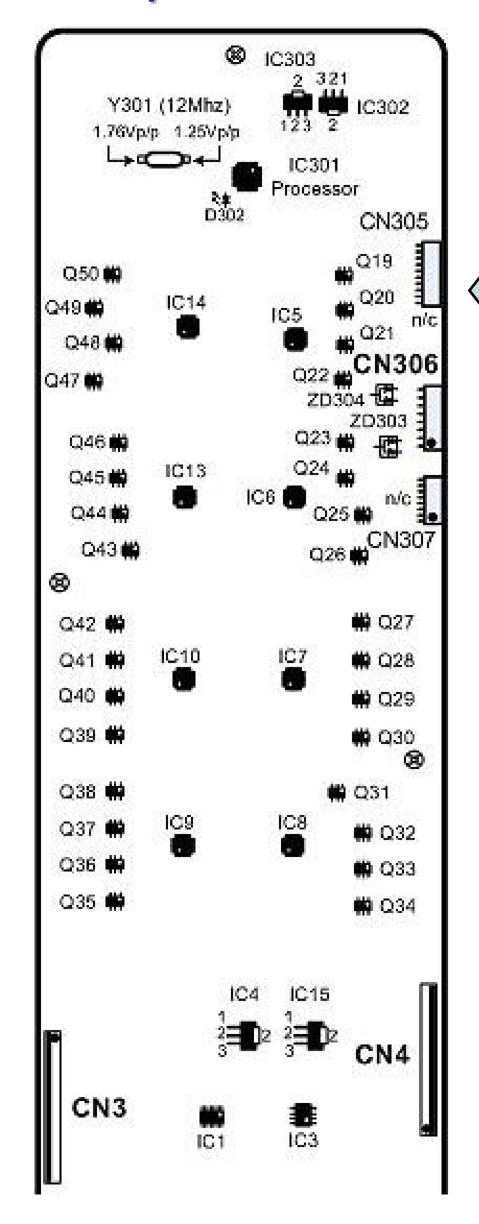


Actual Video capture **Actual LED reaction capture**

To see a representation of the “Local Dimming” the TV has to be set to the “Store Mode”.

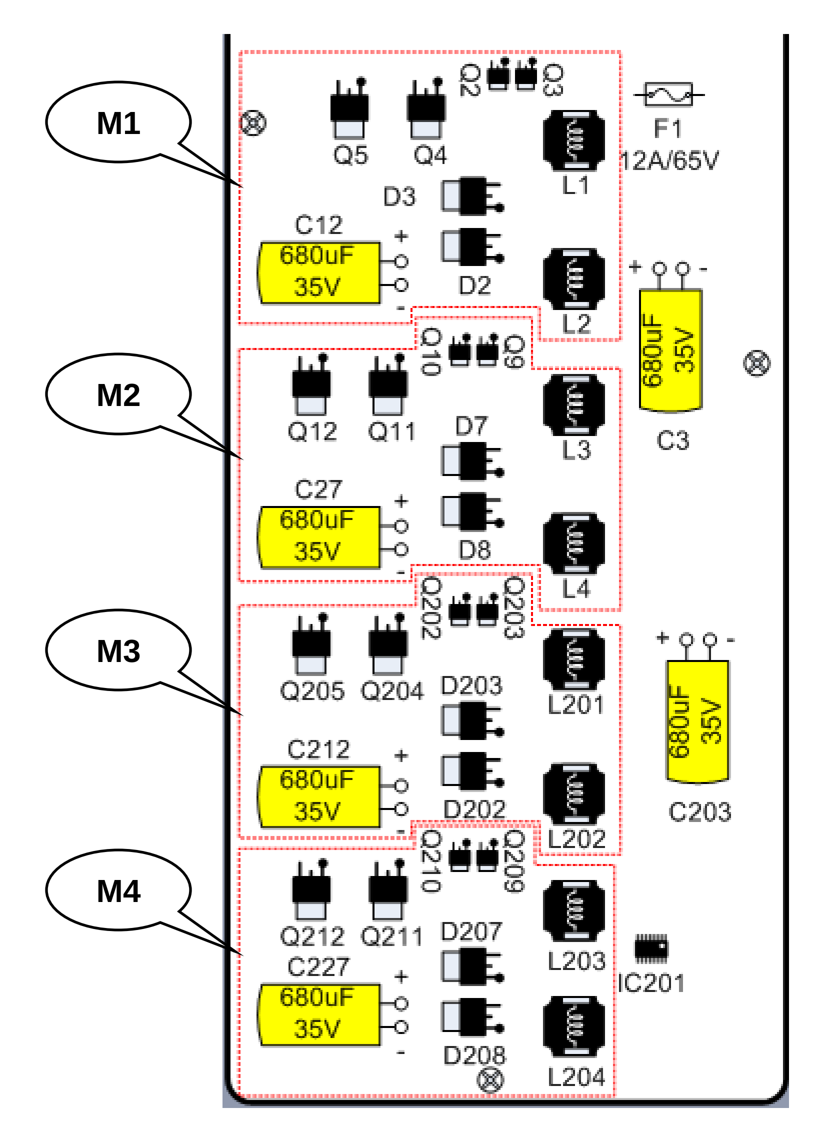
Note: These graphics are from the 47LG90 which has more LEDs than the 42LH90, but the explanation remains the same.

Inverter Component Identification

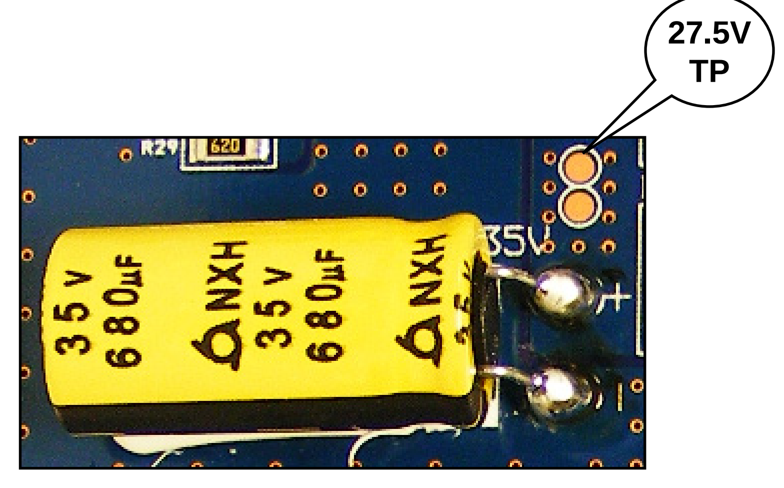




Inverter 27V (M 1-M4 Power Supplies) Information



There are actually 4 power supplies developing the operational B+ (27.5V) for the LED blocks. They are designated as “M1 through M4”.
Each of the 4 have the same components.



Each of the 4 capacitors C12, C27, C212 and C227 have a TP just above the (+) leg of the cap.

Inverter Component Top Half Identification

D302 blinks at 1Hz when all is OK

Example: Q35

Q35 - Q50 Are LED Block Drivers for CN3

Example

V34 → ○ ■ ○ ← V33

Q19 through Q50
Note: Each output driver (switch) has a TP to the left and right representing a "V" which indicates a Block of LEDs.
In the example Q35 above;
V34 represents Pin 23 of CN4
V33 represents Pin 24 of CN4
Grounding these points when the 27.6V supplies are working will cause the entire Block of Backlight LEDs to turn on.
(100mA to light one block)

Local Dimming Control Signals To P306 from Main

(Pin 6) 3.46Vp/p

(Pin 4) 3.48Vp/p

(Pin 1) 3.54Vp/p

Q19 - Q34 Are LED Block Drivers fro CN4

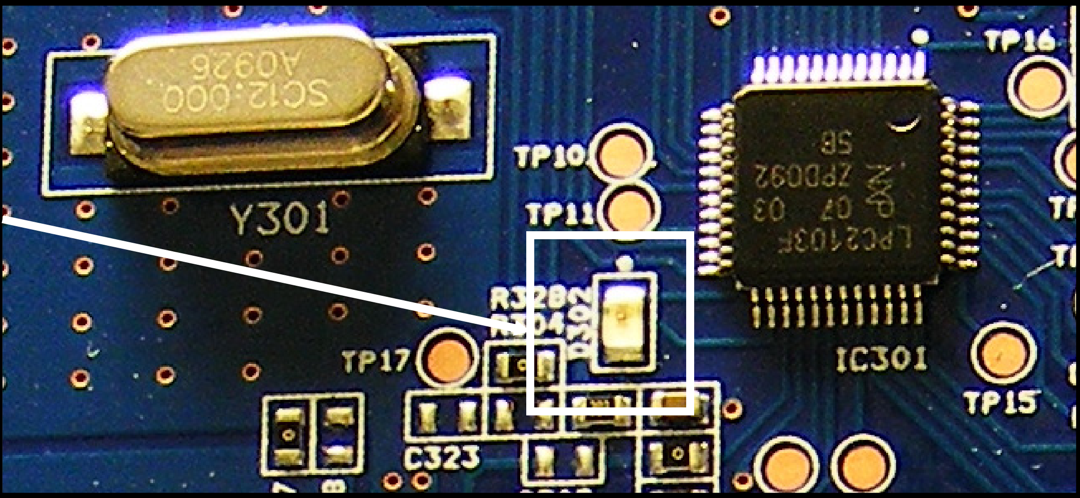
Voltage Supplies to each connector.

CN3	**CN4**
27.5V Line on CN3	**27.5V Line on CN4**
Pins 1-2 (Out_M2)	Pins 1-2 (Out_M3)
Pins 13-14 (Out_M2)	Pins 13-14 (Out_M3)
Pins 16-17 (Out_M2)	Pins 16-17 (Out_M3)
Pins 26-29 (Out_M2)	Pins 26-29 (Out_M3)
Pins 31-32 (Out_M4)	Pins 31-32 (Out_M1)
Pins 43-44 (Out_M4)	Pins 43-44 (Out_M1)
Pins 46-47 (Out_M4)	Pins 46-47 (Out_M1)
Pins 58-59 (Out_M4)	Pins 58-59 (Out_M1)



Inverter LED D302 Information

LED D302



LED D302 blinks at 1Hz to indicate that the Inverter is running correctly.

When it blinks at any other rate, it indicates there is an abnormal state of the Inverter.

When it doesn't blink, check the 24V arriving at the board on CN1 pins 1~5.
Check the two fuses F1 and F2 for 24V.
Check IC302 and IC303 regulator voltages (see page 56).

Inverter Fuse F1 and F2 Check

Center of the Board
Left of CN1 Connector

F1
2A/125V

F2
12A/65V

F1 or F2
Normal 24V in Run

F1 or F2 (Diode Mode Check)
Open (Red Lead on Fuse)
0.46V (Black Lead on Fuse)



Inverter Crystal Y301 Information

Y301 (12Mhz)
1.76Vp/p 1.25Vp/p

IC303 IC302 IC301 Processor D302 CN305 CN306 CN307 CN3 CN4

Crystal Y301

0V

Connect Scope between Left Leg and Gnd

500mV per/div	40nSec	1.25V p/p

Connect Scope between Right Leg and Gnd

500mV per/div	40nSec	1.76V p/p

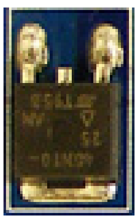


Inverter 27V (M 1-M4 Power Supplies) Checks

There are actually 4 power supplies developing 27.5V for the LED blocks. They are designated as “M1 through M4” This one is M3. Each of the 4 have the same components.

Q4, Q5, Q11, Q11, Q12, Q204, Q205, Q211, Q212

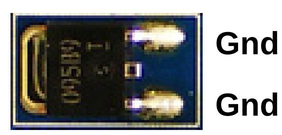
Gnd 3.67V



23.9V

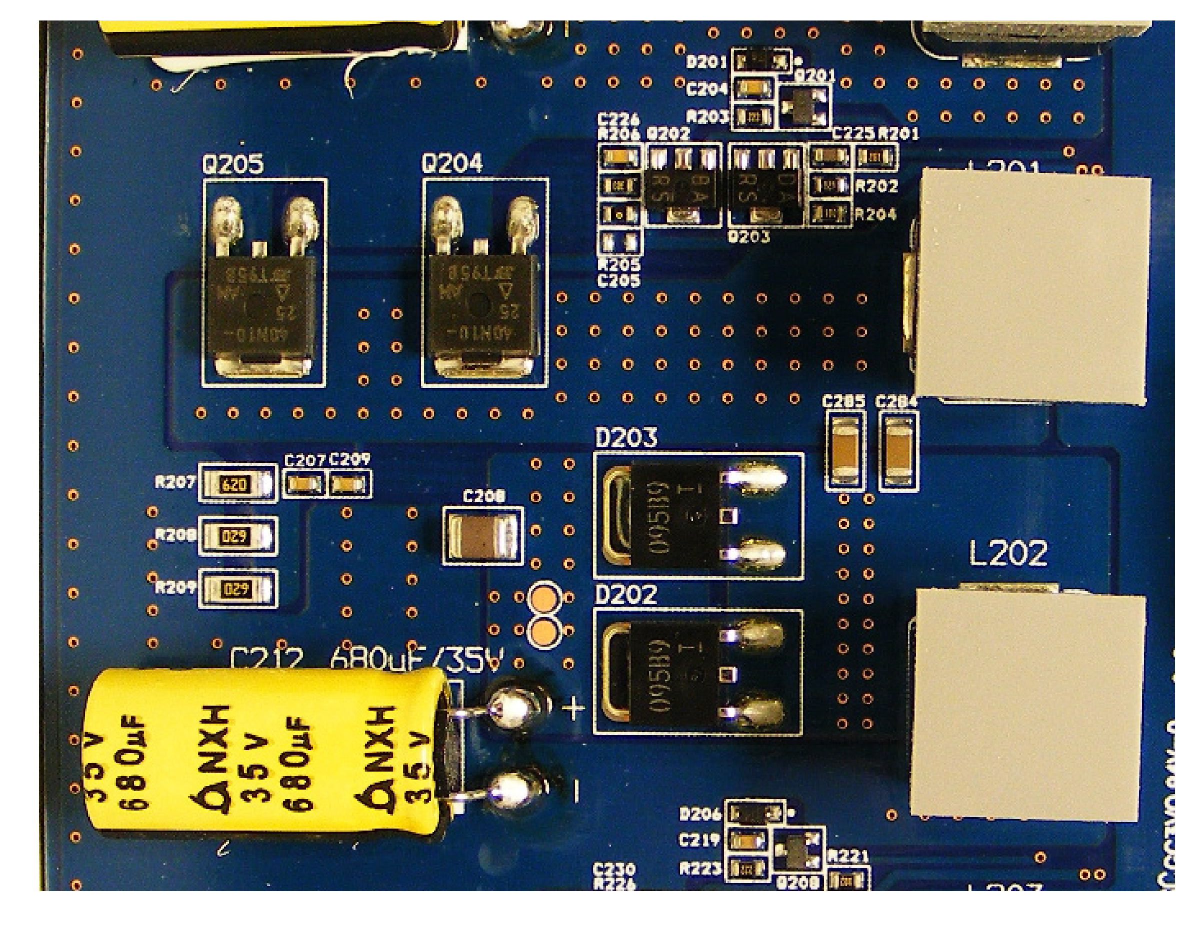
D2, D3, D7, D8, D202, D203, D207, D208

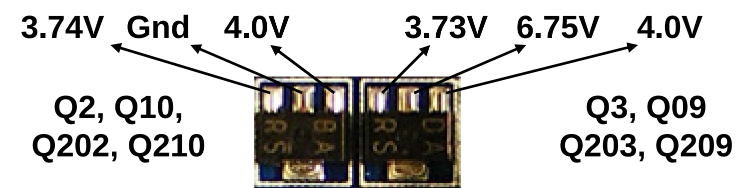
26.4V
28.0V



Gnd
Gnd

Example of M3 (27.5V) Power Supply







Inverter IC2, IC4 and IC15 Checks

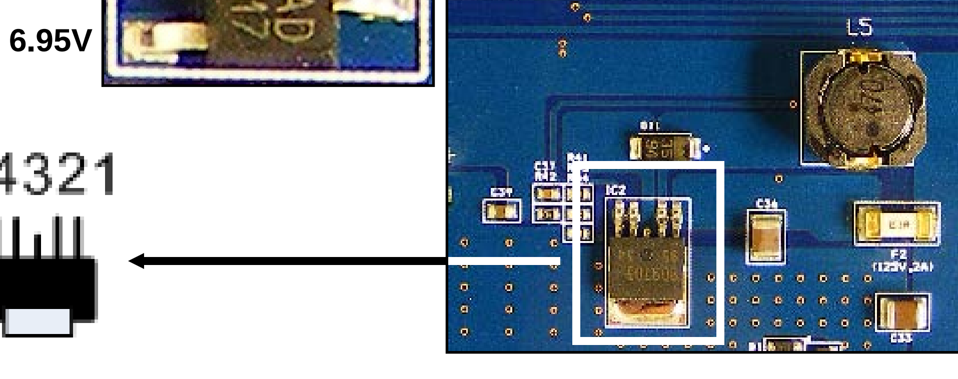
IC4

GND
3.29V
6.99V

IC15

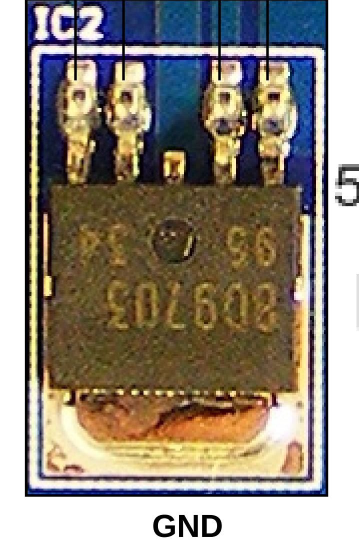
0.46V
1.71V
6.95V

Center of the Board

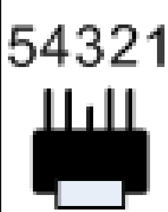


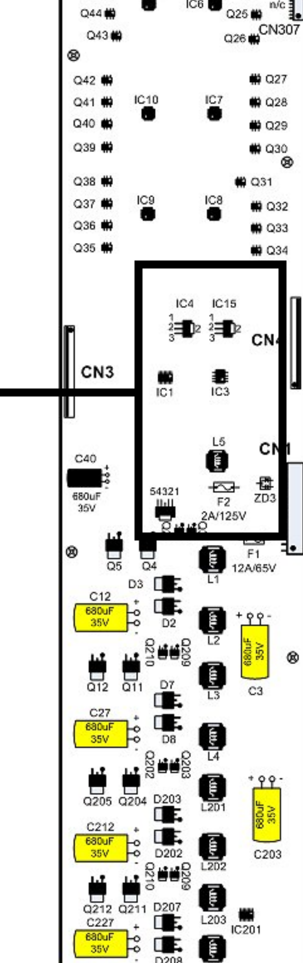
IC2

1.0V 7V
4.6V GND 24V



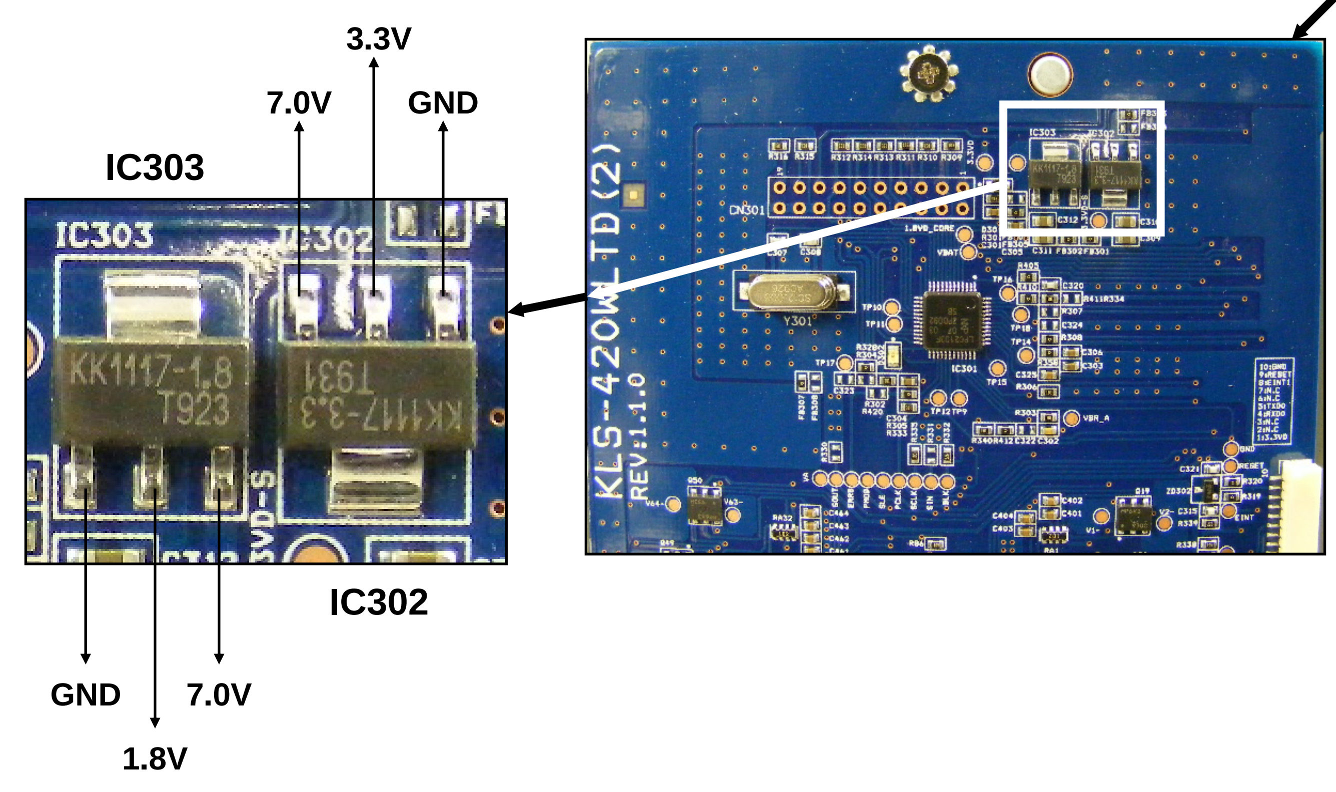
GND

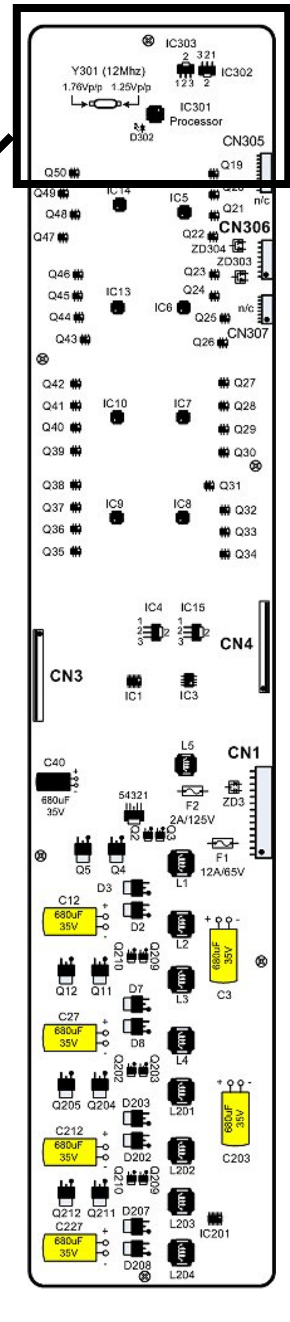






Inverter IC303 and IC302 Checks (Controller IC301 B+)







Inverter Board Connector CN3, CN4 to the Panel (Voltage and Diode Check)

Inverter Run voltages taken with built in test pattern full white screen

Diode Mode values taken with all Connectors Removed

Note 46-47 Incorrect Silk Screening on Board.

CN3 Inverter to Panel

Pin	Label	Run	Resistance
1~2	Out_M2	27.0V	OPEN
3	n/c	0V	OPEN
4~7	V8~V5	0.7-1.2V	OPEN
8~11	V13~V16	0.7-1.2V	OPEN
12	n/c	0V	OPEN
13~14	Out_M2	27.0V	OPEN
15	n/c	0V	OPEN
16~17	Out_M2	27.0V	OPEN
18	n/c	0V	OPEN
19~22	V24~V21	0.7-1.2V	OPEN
23~26	V29~V32	0.7-1.2V	OPEN
27: n/c	n/c	0V	OPEN
28~29	Out_M2	27.0V	OPEN
30	n/c	0V	OPEN
31~32	Out_M4	27.0V	OPEN
33	n/c	0V	OPEN
34~37	V40~V37	0.7-1.2V	OPEN
38~41	V45~V48	0.7-1.2V	OPEN
42	n/c	0V	OPEN
43~44	Out_M4	27V	OPEN
45	n/c	0V	OPEN
46~47	Out_M4	27V	OPEN
48	n/c	0V	OPEN
49~52	V56~V53	0.7-1.2V	OPEN
53~56	V61~V64	0.7-1.2V	OPEN
57	n/c	0V	OPEN
58~59	Out_M4	27.0V	OPEN
60	n/c	0V	OPEN

CN4 Inverter to Panel

Pin	Label	Run	Resistance
60	n/c	0V	OPEN
58~59	Out_M1	27V	OPEN
57	n/c	0V	OPEN
53~56	V4~V1	0.7-1.2V	OPEN
49~52	V9~V12	0.7-1.2V	OPEN
48	n/c	0V	OPEN
46~47	Out_M1	27.0V	OPEN
45: n/c	n/c	0V	OPEN
43~44	Out_M1	27.0V	OPEN
42	n/c	0V	OPEN
38~41	V20~V17	0.7-1.2V	OPEN
34~37	V25~V28	0.7-1.2V	OPEN
33	n/c	0V	OPEN
31~32	Out_M1	27.0V	OPEN
30	n/c	0V	OPEN
28~29	Out_M3	27.0V	OPEN
27	n/c	0V	OPEN
23~26	V34~V33	0.7-1.2V	OPEN
19~22	V41~V44	0.7-1.2V	OPEN
18	n/c	0V	OPEN
16~17	Out_M3	27.0V	OPEN
15	n/c	0V	OPEN
13~14	Out_M3	27.0V	OPEN
12	n/c	0V	OPEN
8~11	V52~V49	0.7-1.2V	OPEN
4~7	V57~60	0.7-1.2V	OPEN
3	n/c	0V	OPEN
1~2	Out_M3	27V	OPEN

Inverter Board Connector CN1 to the P203 "SMPS" (Voltage and Diode Check)

Inverter Run voltages taken with built in test pattern full white screen

CN1 Connector "Inverter" to P203 "SMPS"

Error (Pin 14)

P-DIM (Pin 13)

Ext_VBR_B (P-DIM) Pin 13 can vary according to type of signal being processed and the OSD Backlight setting. 0.33V 0% to 3.3V 100%. Output from the Video Processor IC100.

Pin	Label	STBY	Run	Diode Mode
14	AGP	0V	0V	OPEN
13	Ext_VBR_B	0V	0.33V-3.2V	OPEN
12	ON/OFF	0V	4.65V	1.6V
11	NC	0.47V	1.66V	OPEN
10	GND	GND	GND	GND
9	GND	GND	GND	GND
8	GND	GND	GND	GND
7	GND	GND	GND	GND
6	GND	GND	GND	GND
5	VIN	0V	24.0V	2.9V
4	VIN	0V	24.0V	2.9V
3	VIN	0V	24.0V	2.9V
2	VIN	0V	24.0V	2.9V
1	VIN	0V	24.0V	2.9V

Diode Mode values taken with all Connectors Removed



Inverter Board Connector CN306 to the P3501 “Main” (Voltage and Diode Check)

Inverter Run voltages taken with built in test pattern full white screen

CN306 Connector “Inverter” to P3501 “Main”

Pin	Label	STBY	Run	Resistance
8	GND	0V	0V	GND
7	GND	0V	0V	OPEN
6	Dclk	0V	0V	OPEN
5	GND	0V	0V	OPEN
4	*Din	0V	**0.7 TO 3.0V***	OPEN
3	NC	0V	0V	OPEN
2	NC	0V	0V	OPEN
1	Scel	0V	0.02V	OPEN

*** Local Dimming Off 0.85V**

Diode Mode values taken with all Connectors Removed



LCD Panel Controller Board

The T-Con Processor UC1 receives from the Main Board via CN1 dual 12 Bit LVDS (Video) Signals and CN2 dual 12 Bit LVDS (Video) Signals. Both LVDS cables are carrying 24 bit signals.

UC1 then processes these signals into TFT Drive Signals.
It delivers its output signals through connectors CN4 and CN5 to drive the LCD Panel.

12V is supplied to the T-Con Board on connector CN1 from the Main Board (easily measured at fuse F1).

There is one regulator that creates 1.8V developed at pin 2 (Center Leg) of U11.

U5 is a DC to DC converter IC which develops the Panels driver voltages.
16V, 3.3V, -5V and 26V.

These voltages can be read at the ribbon connector or at test points on the board which will be identified later.



T-CON (TFT Drive) Board (Shield Removed)

To TFT Panel

T-CON p/n: EAT60665101

To TFT Panel

CN5

CN4

FL2

D9

U12

D7

D10

FL1

UC1

U11

U5

Q1

D8

F1

U10

CN1

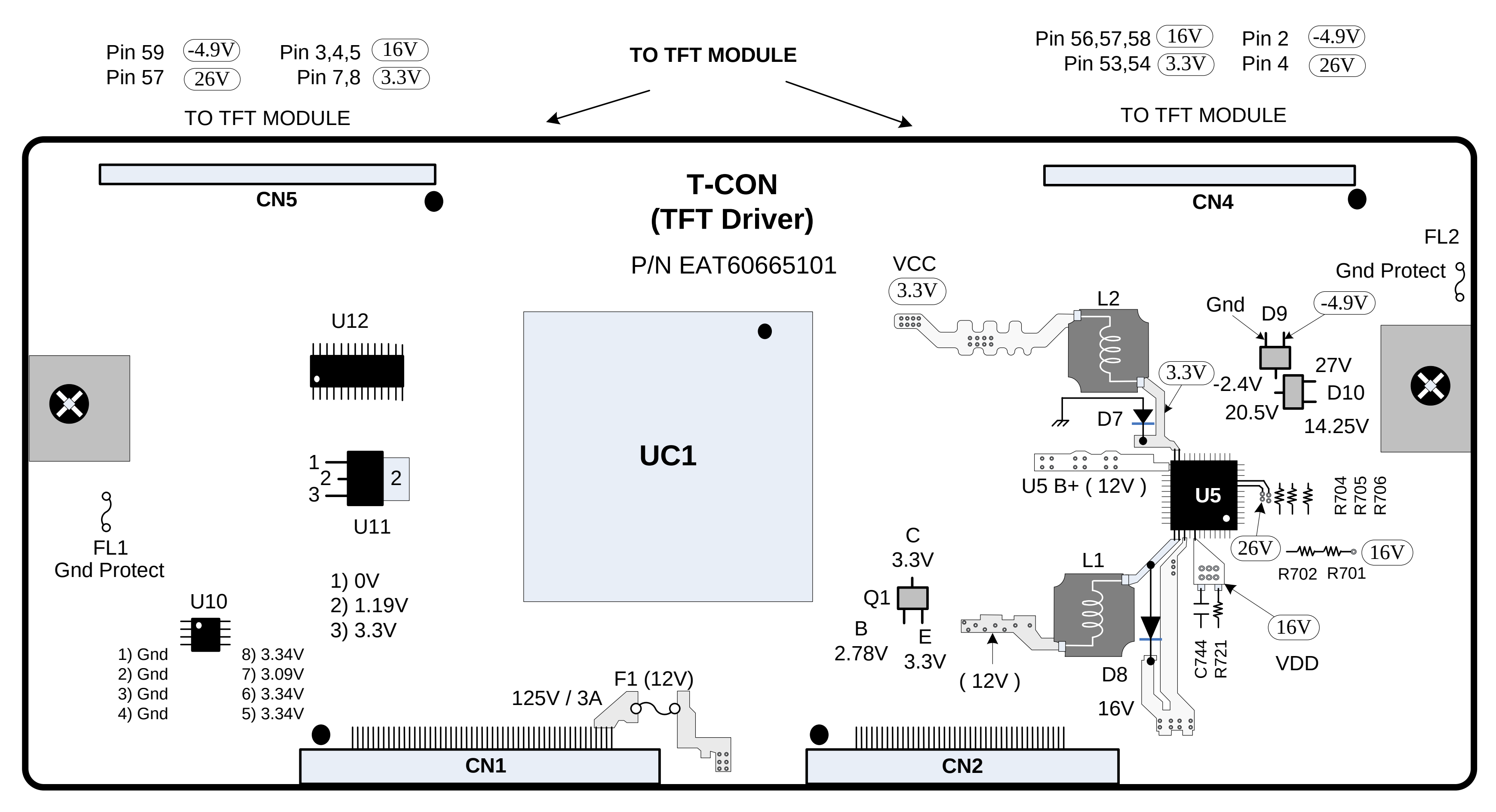
CN2

Remember to replace screws for ground purposes if testing the Board.

To Main Board



42LH90 T-CON (TFT Drive) Board Drawing (Components and Voltages Identified)



T-CON (TFT Drive) Board Checks

T-CON Board

U11 has a piece of "Chocolate" which is heat transfer material. Transfer if board is replaced.

U11

0V

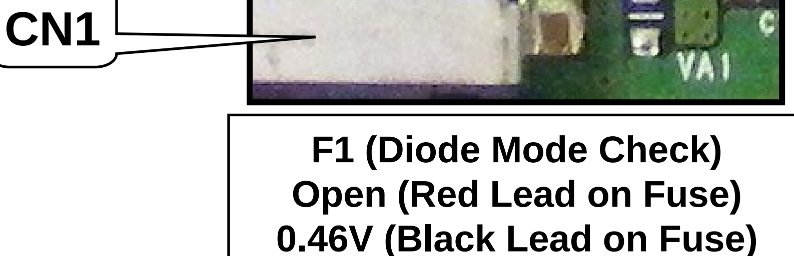
1.8V

3.3V

Check the Regulator U11 for Correct Voltage

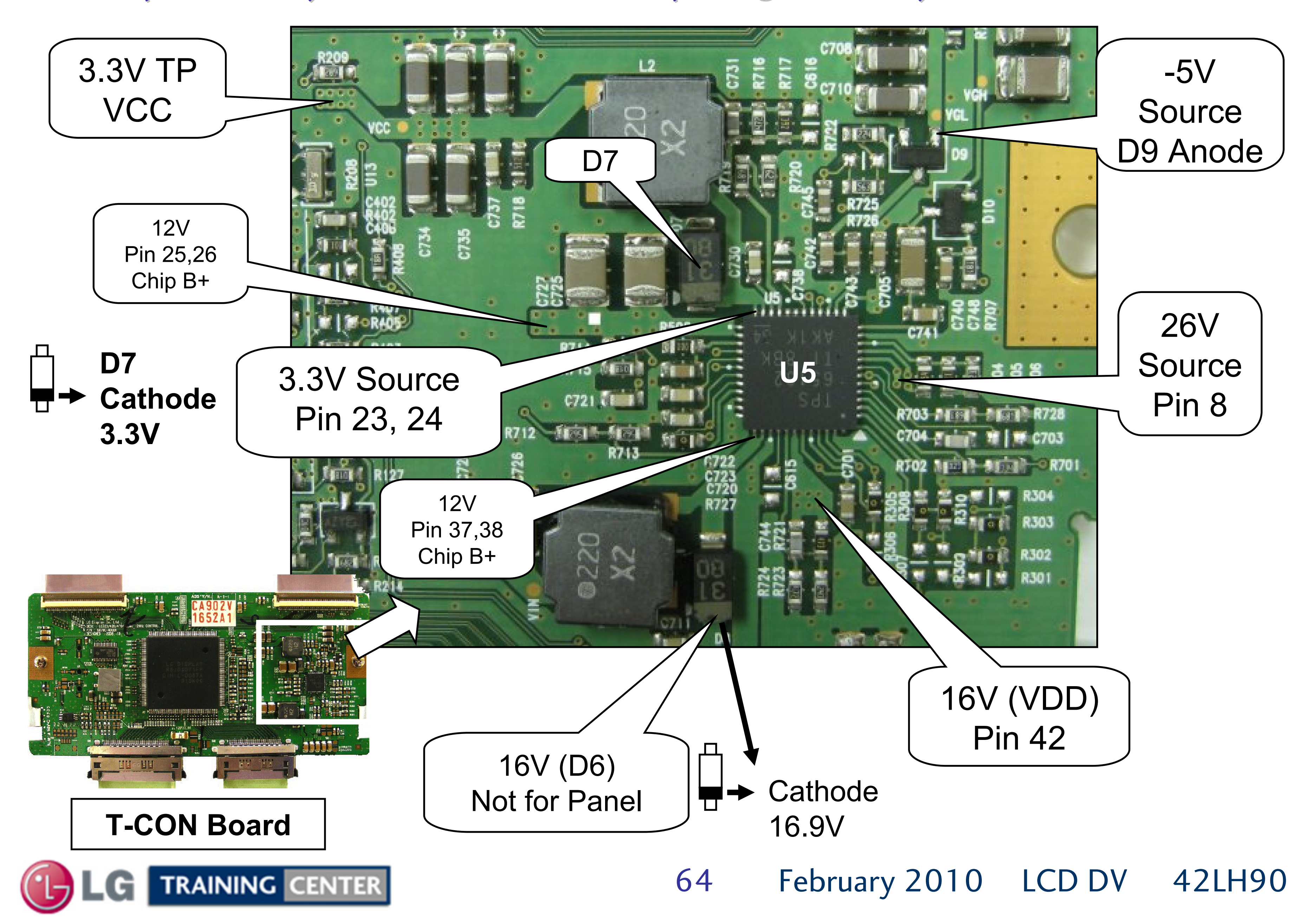
Check Fuse F1 for 12V from CN1 Pins 48~51

F1



F1 (Diode Mode Check)
Open (Red Lead on Fuse)
0.46V (Black Lead on Fuse)

T-CON (TFT Driver) Board CN4 and CN5 (Voltage Sources)



T-CON (TFT Driver) Board CN4 and CN5 (Voltage Check)

CN5

3.3V
Pin 7,8

-5V
Pin 59

26V
Pin 57

16V
Pin 3,4,5

CN4

3.3V
Pin 53,54

16V
Pin 56,57,58

-5V
Pin 2

26V
Pin 4

CN5

CN4

T-CON Board



T-CON Board Connector CN1 to the Main Board (Voltage and Diode Check)

CN1 "T-CON" to P3500 CONNECTOR "Main"

Diode Mode values taken with all Connectors Removed

Pin	Label	Run	Diode Test
1	Gnd	Gnd	Gnd
2	n/c	n/c	n/c
3	n/c	n/c	n/c
4	n/c	n/c	n/c
5	n/c	n/c	n/c
6	n/c	n/c	n/c
7	LVDS-Sel	n/c	Gnd
*8	PWM-DIM	n/c	Open
9	OPC-Out	n/c	Open
10	OPC-EN	n/c	Open
11	OPC-Out2	n/c	Open
12	URSA-A0P	1.3V	Open
13	URSA-A0M	1.2V	Open
14	URSA-A1P	1.3V	Open
15	URSA-A1M	1.2V	Open
16	URSA-A2P	1.4V	Open
17	URSA-A2M	1.4V	Open
18	Gnd	Gnd	Gnd
19	URSA-ACKP	1.25V	Open
20	URSA-ACKM	1.26V	Open

Pin	Label	Run	Diode Test
21	Gnd	Gnd	Gnd
22	URSA-A3P	1.4V	Open
23	URSA-A3M	1.1V	Open
24	URSA-A4P	1.4V	Open
25	URSA-A4M	1.1V	Open
26	Gnd	Gnd	Gnd
27	n/c	n/c	n/c
28	URSA-B0P	1. 4V	Open
29	URSA-B0M	1.1V	Open
30	URSA-B1P	1.4V	Open
31	URSA-B1M	1.1V	Open
32	URSA-B2P	1.21V	Open
33	URSA-B2M	1.22V	Open
34	Gnd	Gnd	Gnd
35	URSA-BCKP	1.21V	Open
36	URSA-BCKM	1.22V	Open
37	Gnd	Gnd	Gnd
38	URSA-B3P	1.2V	Open
39	URSA-B3M	1.21V	Open
40	URSA-B4P	1.44V	Open

Pin	Label	Run	Diode Test
41	URSA-B4M	1.09V	Open
42	Gnd	Gnd	Gnd
43	Gnd	Gnd	Gnd
44	Gnd	Gnd	Gnd
45	Gnd	Gnd	Gnd
46	Gnd	Gnd	Gnd
47	n/c	n/c	n/c
48	**LVDS 12V**	**12V**	**Open**
49	**LVDS 12V**	**12V**	**Open**
50	**LVDS 12V**	**12V**	**Open**
51	**LVDS 12V**	**12V**	**Open**

T-CON Board Connector CN2 to the Main Board (Voltage and Diode Check)

CN2 "T-CON" to P3502 CONNECTOR "Main"

Diode Mode values taken with all Connectors Removed

Pin	Label	Run	Diode Test
1	n/c	n/c	n/c
2	n/c	n/c	n/c
3	n/c	n/c	n/c
4	n/c	n/c	n/c
5	n/c	n/c	n/c
6	n/c	n/c	n/c
7	n/c	n/c	n/c
8	n/c	n/c	n/c
9	Gnd	Gnd	Gnd
10	URSA-C0P	1.28V	Open
11	URSA-C0M	1.2V	Open
12	URSA-C1P	1.3V	Open
13	URSA-C1M	1.2V	Open
14	URSA-C2P	1.3V	Open
15	URSA-C2M	1.2V	Open
16	Gnd	Gnd	Gnd
17	URSA-C2P	1.23V	Open
18	URSA-C2M	1.23V	Open
19	Gnd	Gnd	Gnd
20	URSA-C3P	1.3V	Open

Pin	Label	Run	Diode Test
21	URSA-C3M	1.2V	Open
22	URSA-C4P	1.13V	Open
23	URSA-C4M	1.18V	Open
24	Gnd	Gnd	Gnd
25	Gnd	Gnd	Gnd
26	URSA-D0P	1.29V	Open
27	URSA-D0M	1.25V	Open
28	URSA-D1P	1.29V	Open
29	URSA-D1M	1.3V	Open
30	URSA-D2P	1.3V	Open
31	URSA-D2M	1.2V	Open
32	Gnd	Gnd	Gnd
33	URSA-DCKP	1.23V	Open
34	URSA-DCKM	1.29V	Open
35	Gnd	Gnd	Gnd
36	URSA-D3P	1.3V	Open
37	URSA-D3M	1.25V	Open
38	URSA-D4P	1.4V	Open
39	URSA-D4M	1.15V	Open
40	Gnd	Gnd	Gnd
41	Gnd	Gnd	Gnd



MAIN BOARD SECTION

The Main board receives its operational B+ from the Power Supply via P400.
There are two LVDS cable feeds that go to the T-CON (TFT Driver) section. These carry the duel 12 bit LVDS Video signals and the TruMotion 60Hz duel 12 bit LVDS. These signals have already been prepared for the T-CON board. The Main board also includes the Tuner, Audio and Audio/Video inputs and selection circuits.

Input Voltages from SMPS.

STAND-BY

- **STBY 5V pins 7~10**

RUN

- **12V pins 13 and 14**
- **24V pins 17 and 18.**

The Main board also develops several B+ sources on the board.

STAND-BY VOLTAGES

- **3.3V_ST**

LVDS

- **LVDS 12V (Not generated, but switched from the 12V arriving from the SMPS.**

TUNER and VSB CIRCUIT

- **9V which is used to make 5V TU**
- **5V TU**
- **3.3V**
- **1.2V**

GENERAL

- **5V_General**
- **5V_EXT**

AUDIO

- **3.3V**
- **1.8V**

Mstar IC100 Video and Micro Processors

- **1.2V**

IC3502 Tru-Motion and Dimming IC.

- **1.26V_MEMC, 1.8V_MEMC, 1.8V_DDR, and 3.3V**

Main Board Layout

To Panel

P3500

P3502

P3501 to Inverter

IC3502 Dimming Tru-Motion

SW3500 Not used

X3500

VIDEO PROCESSOR IC100 and Tru-Motion IC3502 runs Hot. This is normal.

DDR

P700 to SMPS

IC100 Micro/Video Processor

X800

IC801

DDR

n/c

SW100 Reset

P1200 to IR Board

USB

P600 to Speakers

X100

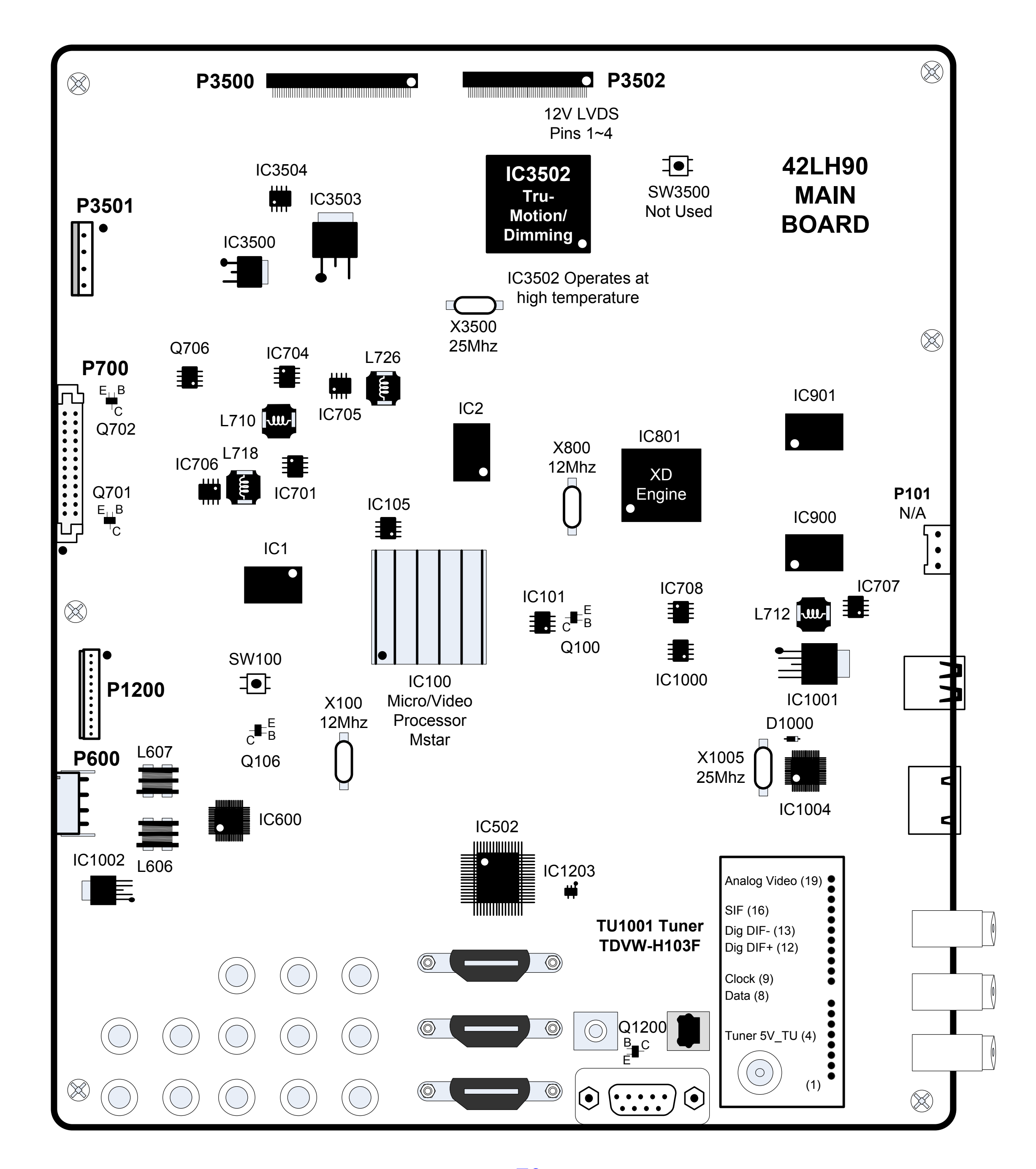
HDMI Selector

IC600 Audio

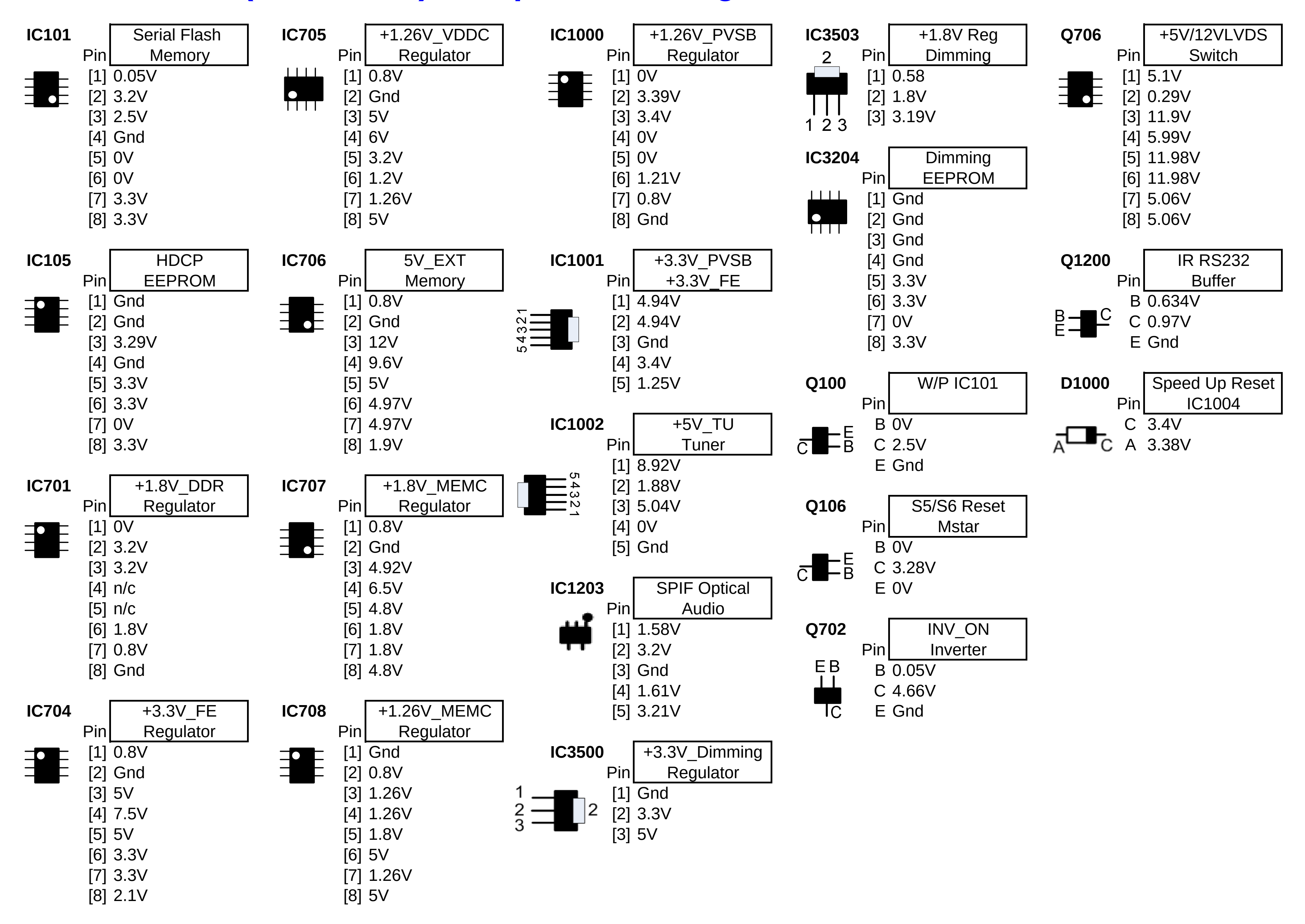
Tuner TU1001

Rear Inputs

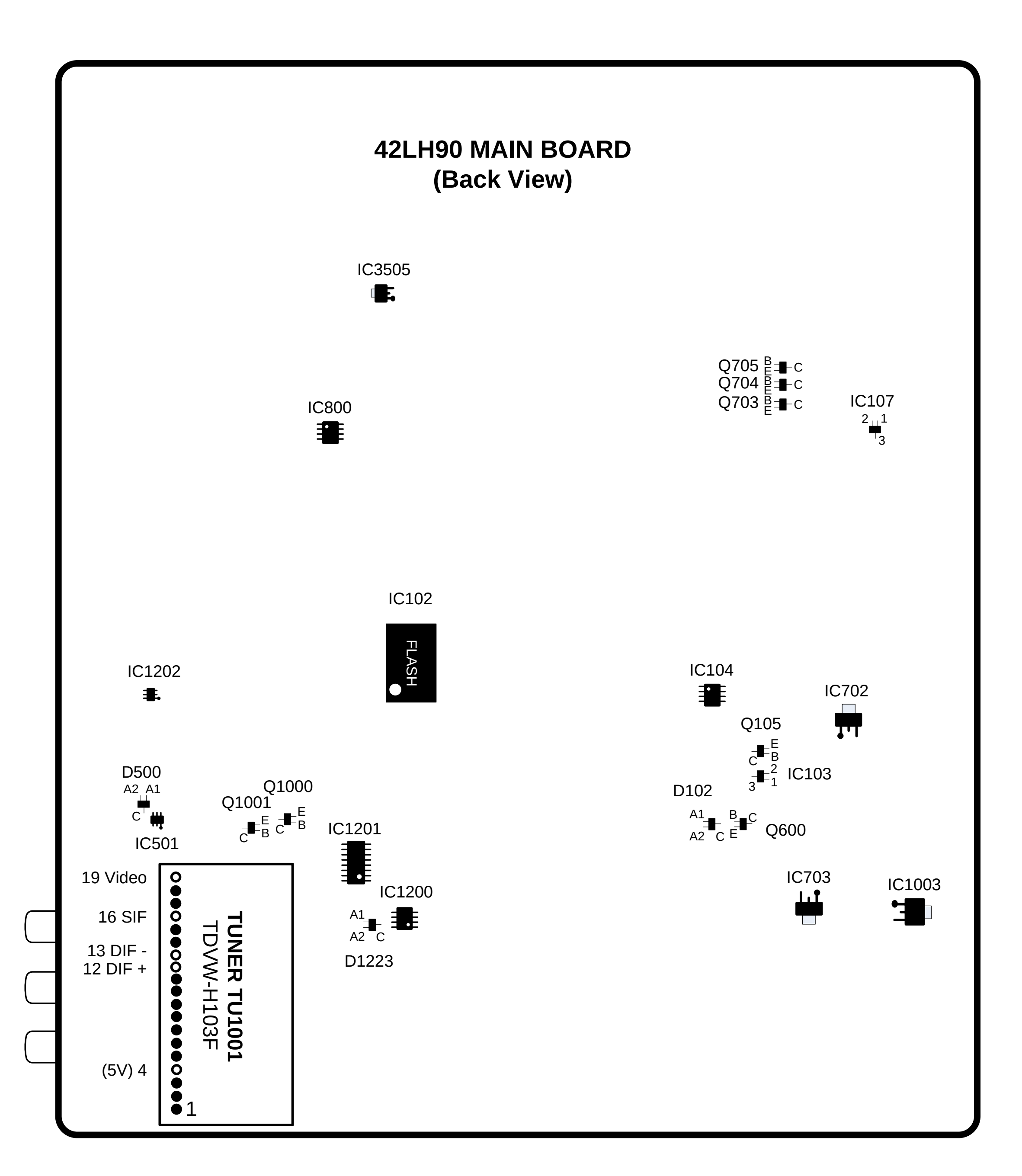
42LH90 Main Board (Front Side) Component Layout



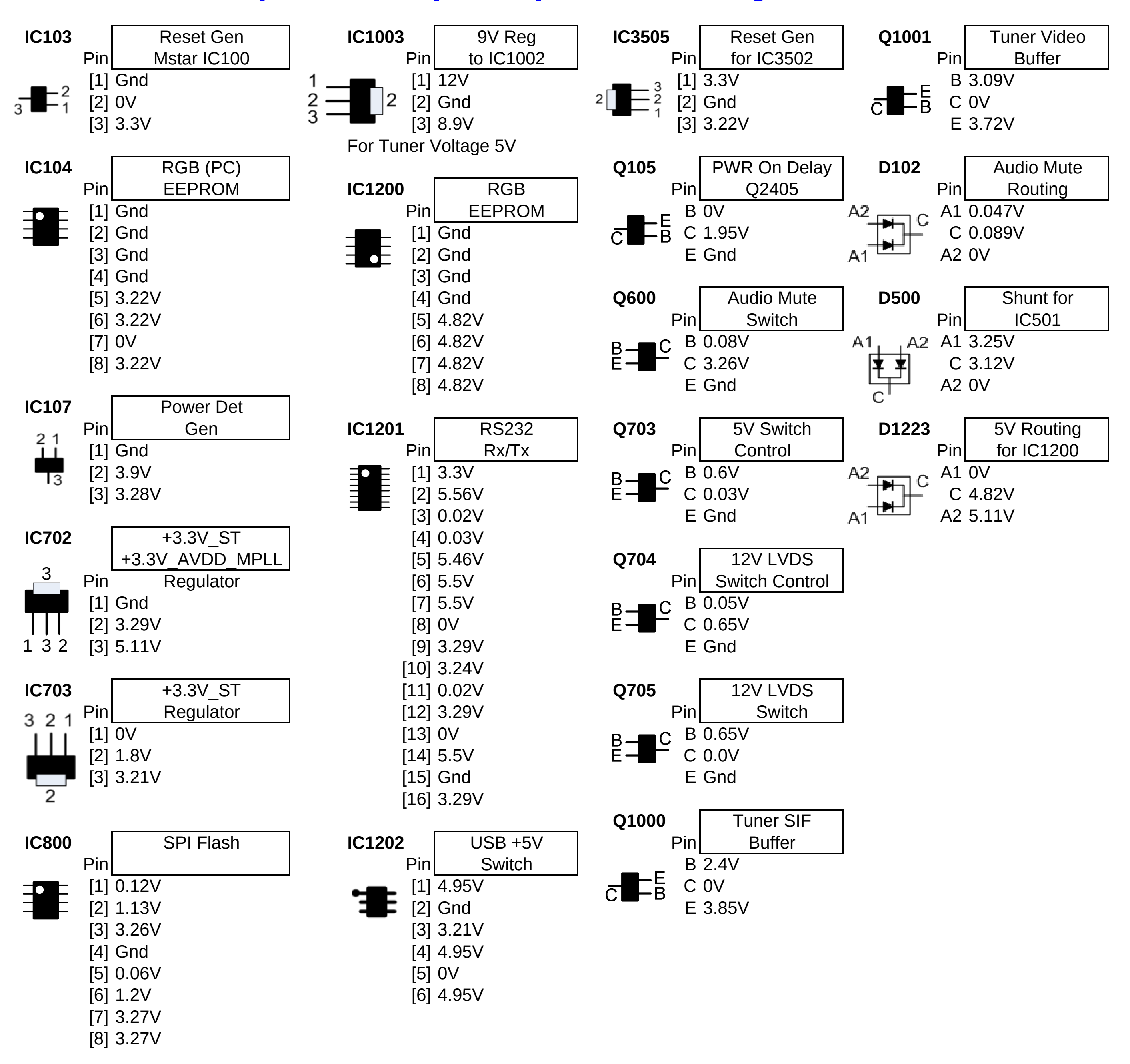
42LH90 Main (Front Side) Component Voltages



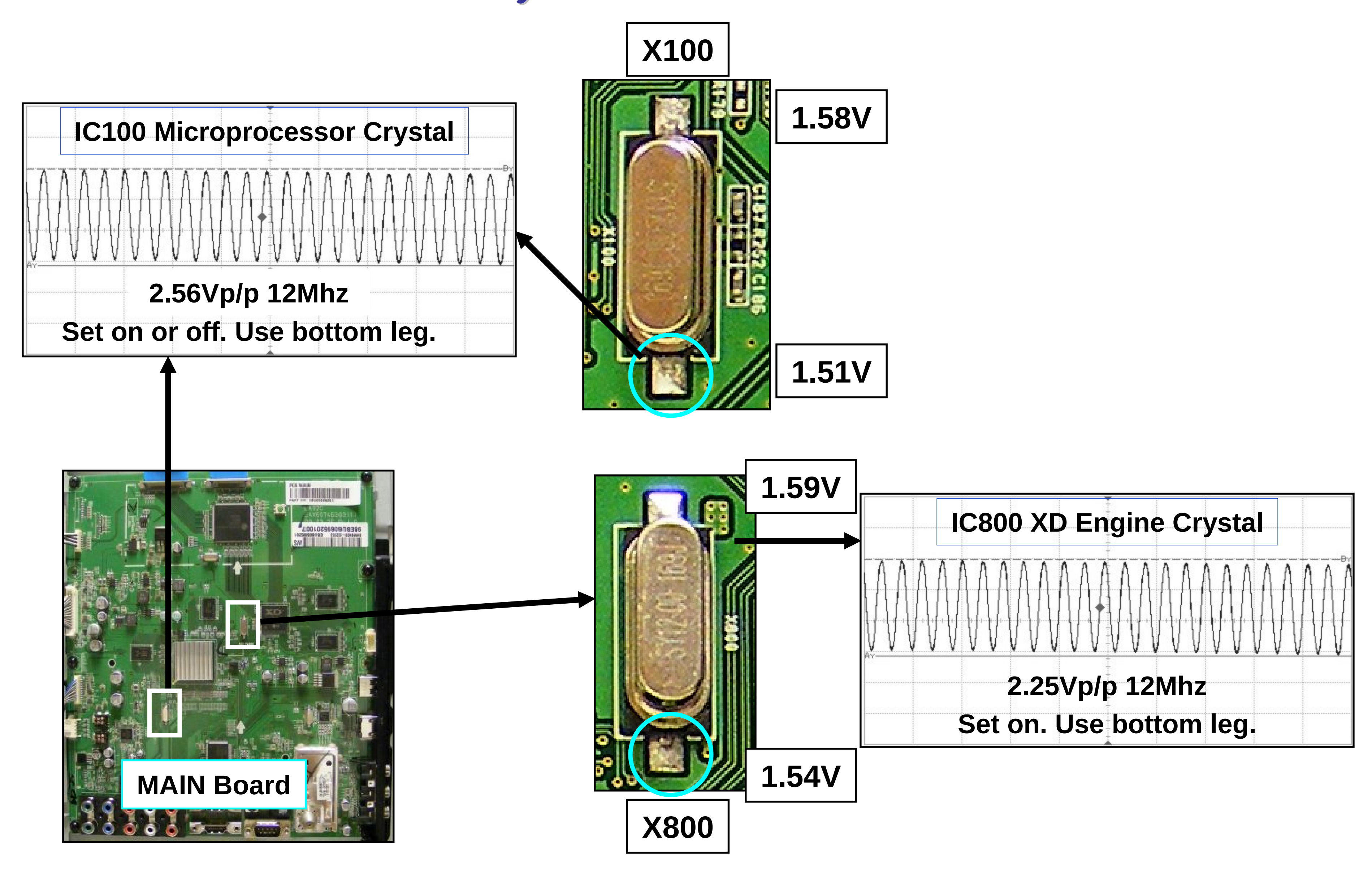
42LH90 Main Board (Back Side) Component Layout



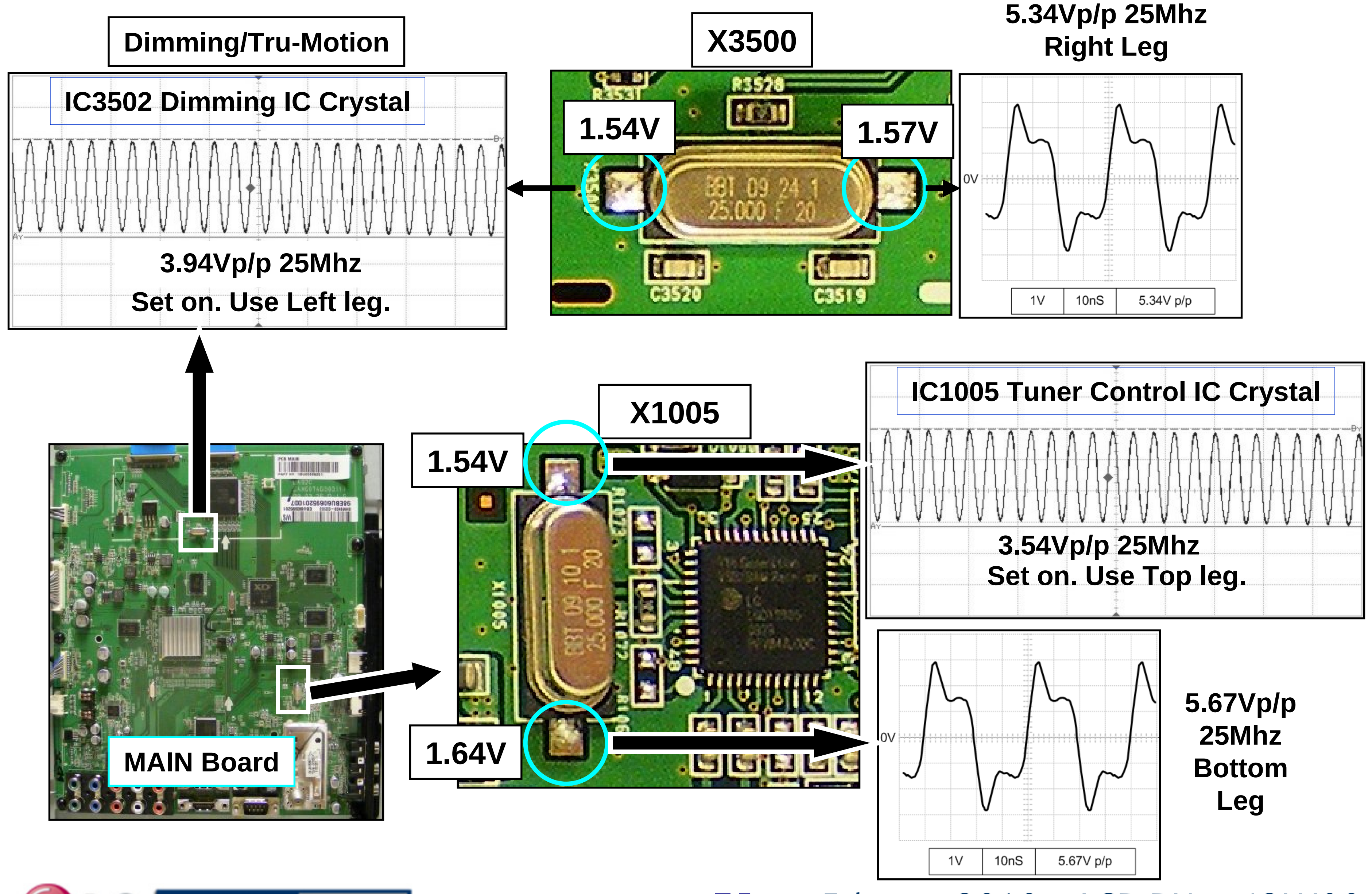
42LH90 Main (Back Side) Component Voltages



Main Board X100 and X800 Crystal Checks

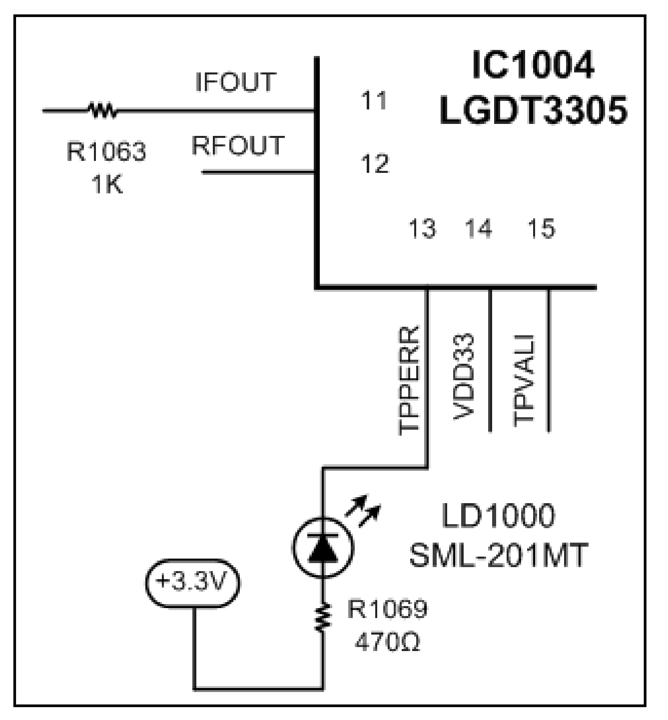


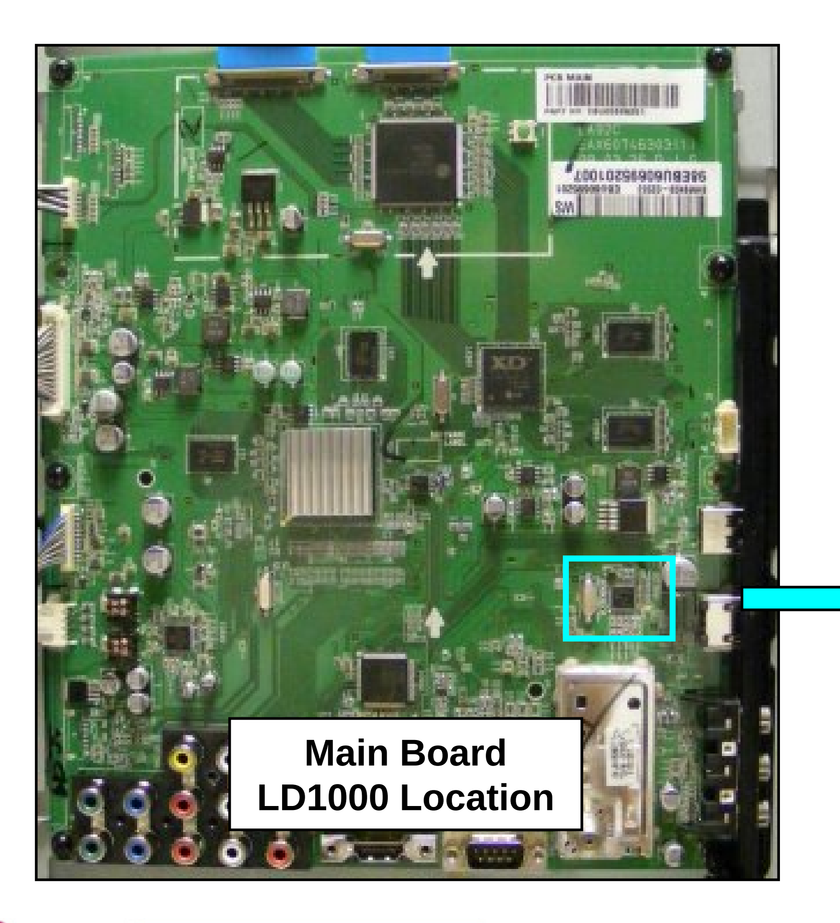
Main Board X3500 and X1005 Crystal Check

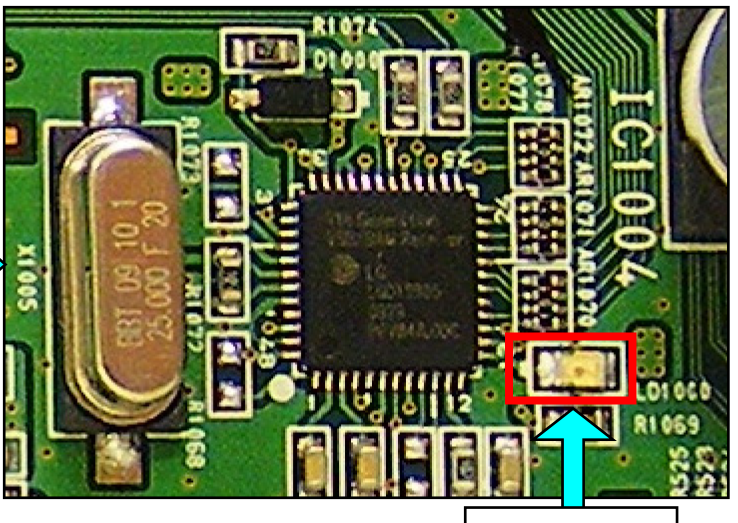


Main Board LD1000 Function

Use LD1000 as a visual aid.
This lets you know the PLL (Phase Lock Loop) circuit is working correctly in IC1004.
This indicates the Tuner Crystal is Locked to the Reference frequency in IC1004.







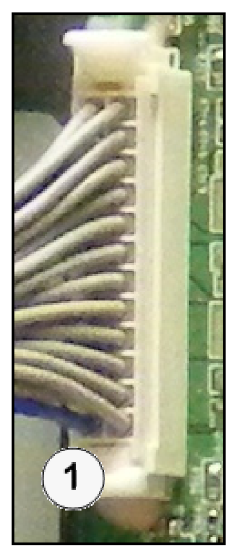




Main Board Connector P700 to Power Supply Voltage and Diode Check

P700 "Main Board" to P201 "SMPS"

P700



Odd Pins

Pin	Label	STBY	Run	Diode Check
23	**nc**	nc	nc	Open
21	**[1]A.DIM**	0.47V	1.66V	Open
19	**nc**	nc	nc	Open
17	**24V**	0V	24V	Open
15	**Gnd**	Gnd	Gnd	Gnd
13	**12V**	0V	12V	2.2V
11	**Gnd**	Gnd	Gnd	Gnd
9	**5.2V**	5.15V	5.15V	1.1V
7	**5.2V**	5.15V	5.15V	1.1V
5	**Gnd**	Gnd	Gnd	Gnd
3	**Gnd**	Gnd	Gnd	Gnd
1	**nc**	nc	nc	Open

Even Pins

Pin	Label	STBY	Run	Diode Check
24	**[2]PDIM**	0V	2.43V	1.3V
22	**Err Out**	0V	0V	Open
20	**Inv_On**	0V	4.65V	2.9V
18	**24V**	0V	24V	Open
16	**Gnd**	Gnd	Gnd	Gnd
14	**12V**	0V	12V	2.2V
12	**Gnd**	Gnd	Gnd	Gnd
10	**5.2V**	5.15V	5.15V	1.1V
8	**5.2V**	5.15V	5.15V	1.1V
6	**Gnd**	Gnd	Gnd	Gnd
4	**Gnd**	Gnd	Gnd	Gnd
2	**PWR-ON**	0V	5V	2.6V

[1]ADIM Pin 21 Fixed and not used.
It is an Open connection on the Inverter Board.

[2]PDIM Pin 24 can vary according to type of signal being processed, OSD Backlight setting. 0.6V 0% to 3.3V 100% and the Intelligent Sensor. Output from the Video Processor IC100.

Diode Mode values taken with all Connectors Removed



Main Board Connector P3500 to the T-CON Voltage and Diode Check

P3500 CONNECTOR "Main" to "T-CON" CN1

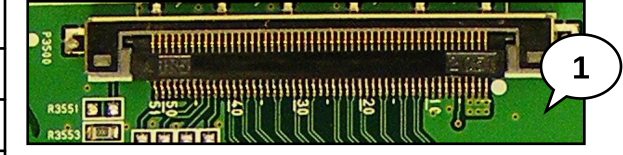
Diode Mode values taken with all Connectors Removed

Pin	Label	Run	Diode Test
1	**LVDS 12V**	**12V**	**Open**
2	**LVDS 12V**	**12V**	**Open**
3	**LVDS 12V**	**12V**	**Open**
4	**LVDS 12V**	**12V**	**Open**
5	n/c	n/c	n/c
6	Gnd	Gnd	Gnd
7	Gnd	Gnd	Gnd
8	Gnd	Gnd	Gnd
9	Gnd	Gnd	Gnd
10	Gnd	Gnd	Gnd
11	LVDS_CH2_E+	1.09V	1.23V
12	LVDS_CH2_E-	1.44V	0.875V
13	LVDS_CH2_D+	1.09V	1.23V
14	LVDS_CH2_D-	1.44V	1.23V
15	Gnd	Gnd	Gnd
16	LVDS_CH2_CLK+	1.22V	1.14V
17	LVDS_CH2_CLK-	1.21V	1.25V
18	Gnd	Gnd	Gnd
19	LVDS_CH2_C+	1.13V	1.23V
20	LVDS_CH2_C-	1.4V	0.87V

Pin	Label	Run	Diode Test
21	LVDS_CH2_B+	1.1V	0.87V
22	LVDS_CH2_B-	1.4V	1.2V
23	LVDS_CH2_A+	1.1V	1.22V
24	LVDS_CH2_A-	1.4V	0.88V
25	n/c	n/c	n/c
26	Gnd	Gnd	Gnd
27	LVDS_CH1_E+	1.1V	0.87V
28	LVDS_CH1_E-	1.4V	1.23V
29	LVDS_CH1_D+	1.1V	1.23V
30	LVDS_CH1_D-	1.4V	1.23V
31	Gnd	Gnd	Gnd
32	LVDS_CH1_CLK+	1.26V	1.20V
33	LVDS_CH1_CLK-	1.25V	1.2V
34	Gnd	Gnd	Gnd
35	LVDS_CH1_C+	1.4V	0.88V
36	LVDS_CH1_C-	1.4V	1.22V
37	LVDS_CH1_B+	1.2V	1.11V
38	LVDS_CH1_B-	1.3V	1.23V
39	LVDS_CH1_A+	1.2V	1.18V
40	LVDS_CH1_A-	1.3V	1.05V

Pin	Label	Run	Diode Test
41	Gnd	Gnd	Gnd
42	OPC-EN	n/c	1.09V
43	OPC-Out	n/c	Open
44	*PWM-DIM	n/c	Open
45	LVDS-Sel	n/c	Open
46	n/c	n/c	Open
47	n/c	n/c	Open
48	n/c	n/c	Open
49	n/c	n/c	Open
50	n/c	n/c	Open
51	Gnd	Gnd	Gnd

PWM-DIM (Pin 44) is Open on the Main Board.



P3500

Main Board Connector P3502 to the T-CON Voltage and Diode Check

P3502 CONNECTOR "Main" to "T-CON" CN2

Diode Mode values taken with all Connectors Removed

Pin	Label	Run	Diode Test
1	Gnd	Gnd	Gnd
2	Gnd	Gnd	Gnd
3	LVDS_CH4_E+	1.15V	1.18V
4	LVDS_CH4_E-	1.4V	1.24V
5	LVDS_CH4_D+	1.25V	0.87V
6	LVDS_CH4_D-	1.3V	1.12V
7	Gnd	Gnd	Gnd
8	LVDS_CH4_CLK+	1.29V	1.22V
9	LVDS_CH4_CLK-	1.3V	1.23V
10	Gnd	Gnd	Gnd
11	LVDS_CH4_C+	1.2V	0.87V
12	LVDS_CH4_C-	1.3V	0.87V
13	LVDS_CH4_B+	1.3V	1.23V
14	LVDS_CH4_B-	1.29V	0.87V
15	LVDS_CH4_A+	1.25V	1.23V
16	LVDS_CH4_A-	1.29V	0.87V
17	Gnd	Gnd	Gnd
18	Gnd	Gnd	Gnd
19	LVDS_CH3_E+	1.18V	1.08V
20	LVDS_CH3_E-	1.13V	1.07V

Pin	**Label**	**Run**	**Diode Test**
21	LVDS_CH3_D+	1.2V	1.2V
22	LVDS_CH3_D-	1.3V	1.23V
23	Gnd	Gnd	Gnd
24	LVDS_CH3_CLK+	1.3V	0.87V
25	LVDS_CH3_CLK-	1.23V	0.87V
26	Gnd	Gnd	Gnd
27	LVDS_CH3_C+	1.2V	1.03V
28	LVDS_CH3_C-	1.3V	0.87V
29	LVDS_CH3_B+	1.2V	0.87V
30	LVDS_CH3_B-	1.3V	1.23V
31	LVDS_CH3_A+	1.2V	1.20V
32	LVDS_CH3_A-	1.28V	0.87V
33	Gnd	Gnd	Gnd
34	n/c	n/c	n/c
35	n/c	n/c	n/c
36	n/c	n/c	n/c
37	n/c	n/c	n/c
38	n/c	n/c	n/c
39	n/c	n/c	n/c
40	n/c	n/c	n/c
41	Gnd	Gnd	Gnd

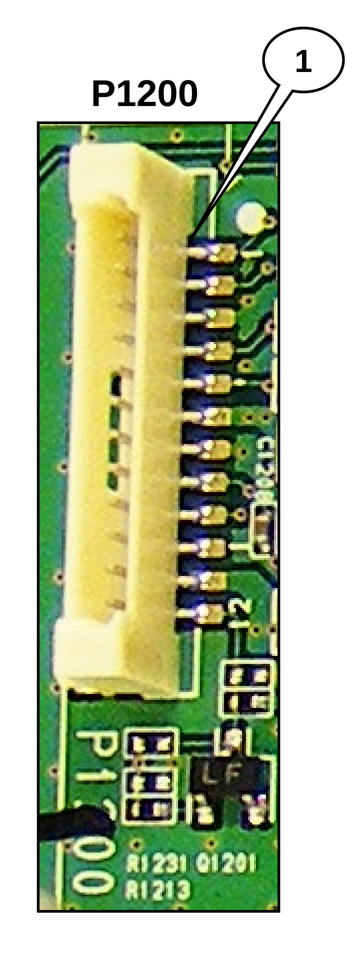
P3502



Main Board Connector P1200 to (Ft. IR/Intelligent Sensor) Voltage and Diode Check

P1200 CONNECTOR "MAIN Board" to P101 "Front IR / Intelligent Sensor Board"

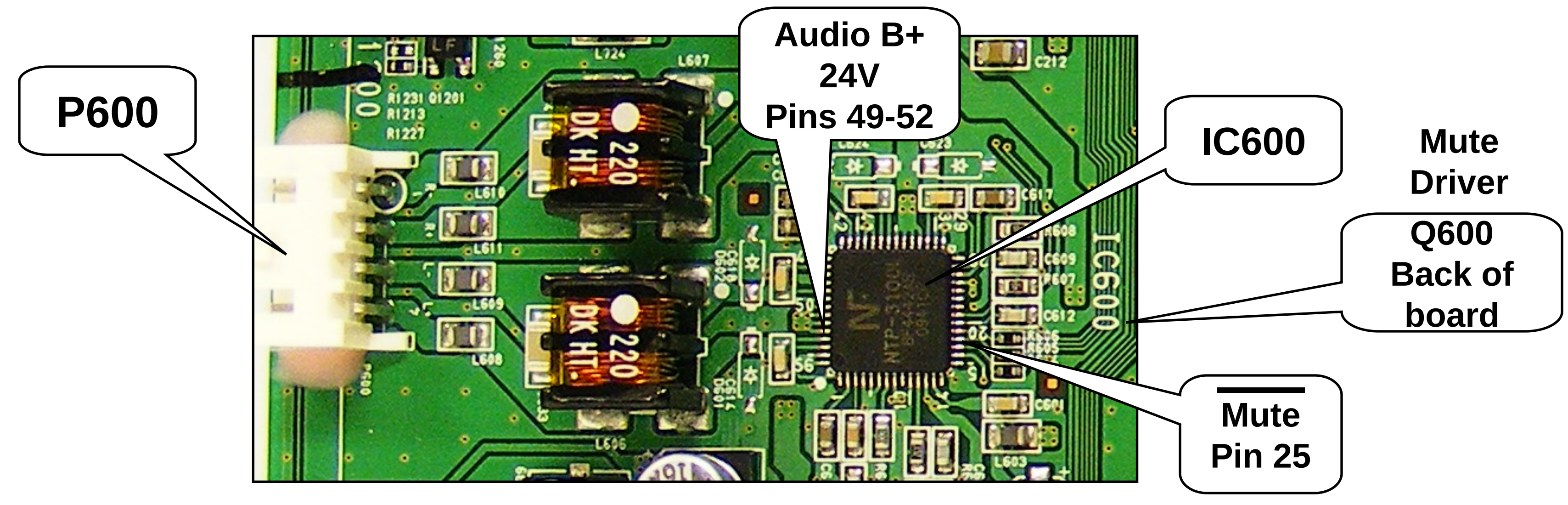
Pin	Label	STBY	Run	Diode Check
1	**SCL**	0.57V	3.2V	1.6V
2	**SDA**	0.57V	3.2V	1.6V
3	**Gnd**	Gnd	Gnd	Gnd
4	**Key1**	3.2V	3.2V	1.0V
5	**Key2**	3.2V	3.2V	1.0V
6	**5V_ST**	**5.1V**	**5.1V**	**1.1V**
7	**Gnd**	Gnd	Gnd	Gnd
8	**WARM_ST**	Gnd	Gnd	Gnd
9	**IR**	3.5V	3.5V	Open
10	**Gnd**	Gnd	Gnd	Open
11	**3.3V_ST**	3.2V	3.2V	0.67V
12	**PWR On**	0V	3.2V	Open



Diode Mode values taken with all Connectors Removed

Main Board Connector P600 to Speakers Voltage and Diode Check

Q400 (Mute) Active Low. Normal 3.3V Collector to Pin 25



Use speaker out to test for defective Audio Amp IC600
Note: (Normal, ½ Audio B+)

P400 CONNECTOR "Main" to "Speakers"				
Pin	**LABEL**	**SBY**	**Run**	**Diode Check**
1	**SPK-R(-)**	0V	12V	2.63V
2	**SPK-R(+)**	0V	12V	2.63V
3	**SPK-L(-)**	0V	12V	2.63V
4	**SPK-L(+)**	0V	12V	2.63V

Diode Mode values taken with all Connectors Removed

FRONT (IR, INTELLIGENT SENSOR and MOVING LED) SECTION

The Intelligent Sensor and IR board (located on the bottom left as viewed from the rear) contains the IR (Infrared Remote Sensor) and the Intelligent Sensor. This board also connects with the Side Key Board and the Moving LED board which contains the 10 front Power LEDs.

The IR board receives it operating B+ via P101 pin 6 (STBY 5V) and pin 11 (3.3V) from connector P1200 on the Main board.

The Intelligent Sensor communicates with the Micro/Video Processor IC100 Mstar Chip via clock and data lines SCL1 and SDA1 (AA17 and AA18) arriving on connector P101 from P700 pins 1 and 2 on the Main board.

The Front Power LEDs are controlled by these same Clock and Data lines which communicate with the LED Driver IC U1 on the Moving LED board.

The IR pulses (5V p/p) P101 pin 9 are sent to P1200 on the Main board and on to the Microprocessor (IC100) via pin C4.

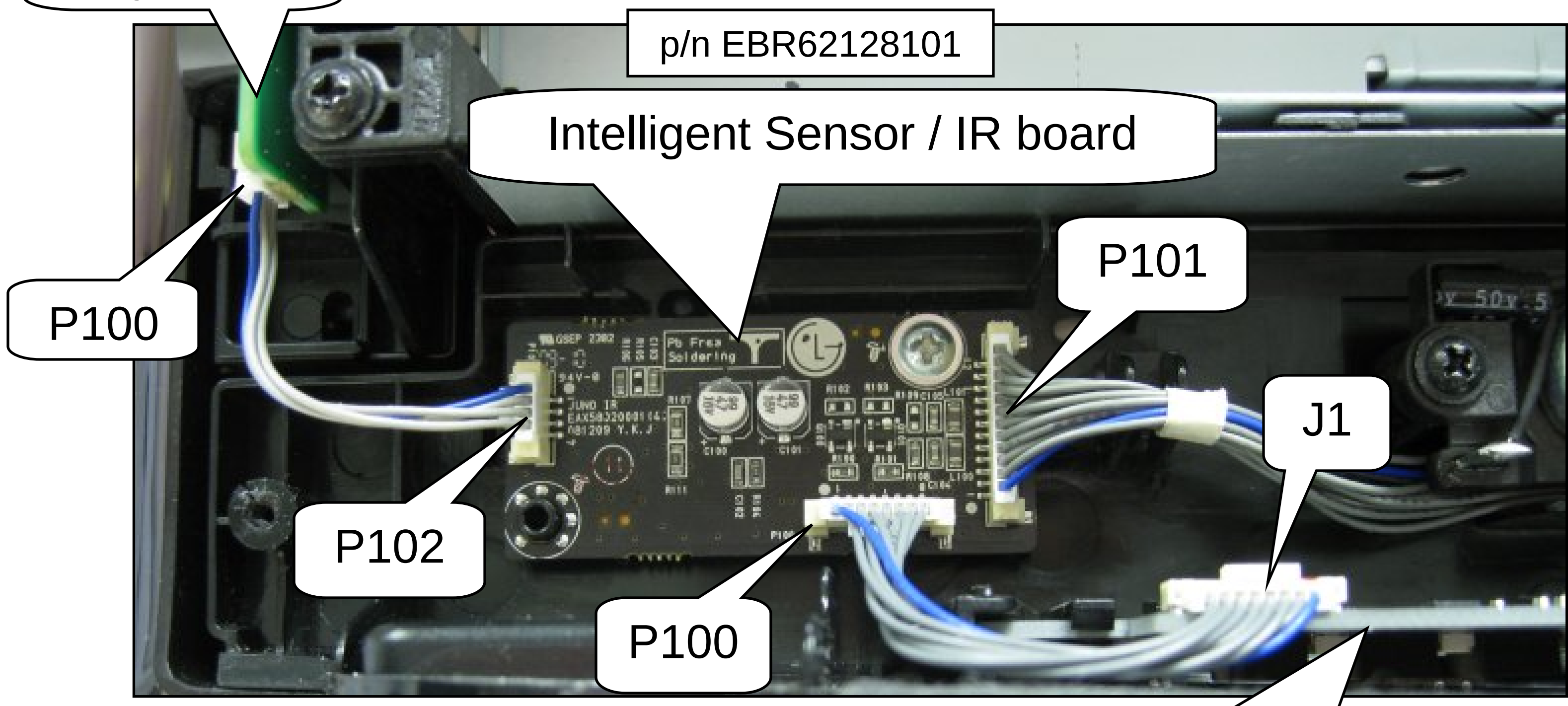
The Key board is routed to the IR board via P100 to P102 on the Key 1 and Key 2 lines, (Key 1 pin 1 and Key 2 pin 3). Then out P101 pins 4 and 5 to P1200 on the Main Board.
Then to the Microprocessor A4 and B4 lines.



Front Boards (Connections Identified)

p/n EBR62127501

Key board

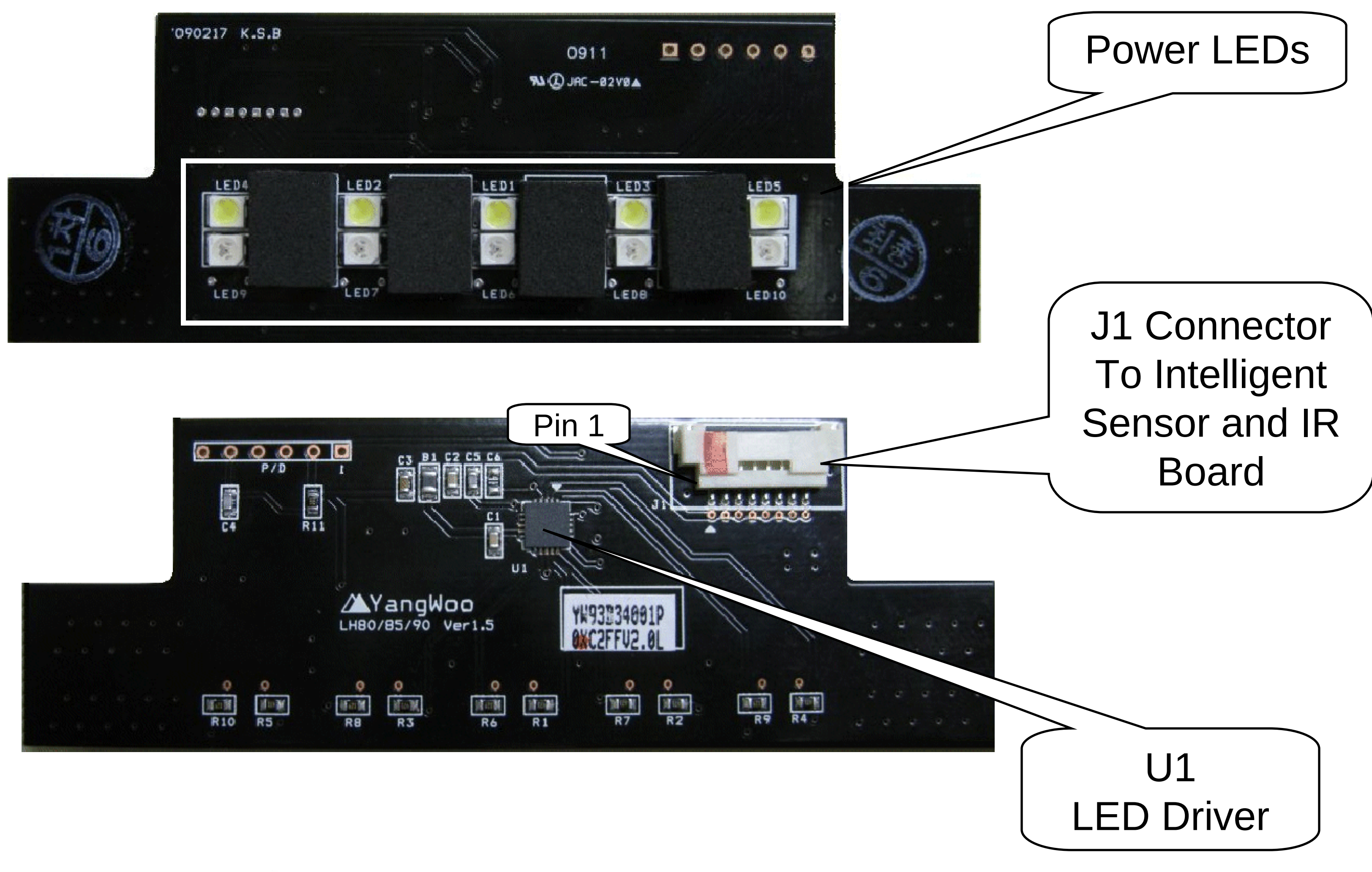


Moving LED board
(Power LEDs)

p/n EBR61674001

Front Moving LED Board Identified

The Front LED Board
(located on the bottom left as viewed from the rear)
Contains the front Power LEDs.



Front Board Connectors P101 and P2 Voltage and Diode Check

P101 CONNECTOR "Front IR / Intelligent Sensor" to P1200 " MAIN Board "

Pin	Label	STBY	Run	Diode Check
1	**SCL**	0.57V	3.2V	Open
2	**SDA**	0.57V	3.2V	Open
3	**Gnd**	Gnd	Gnd	Gnd
4	**Key1**	3.2V	3.2V	Open
5	**Key2**	3.2V	3.2V	Open
6	**ST_5V**	**5.1V**	**5.1V**	**Open**
7	**Gnd**	Gnd	Gnd	Gnd
8	**Warm_ST**	Gnd	Gnd	Open
9	**IR**	3.5V	3.5V	Open
10	**Gnd**	Gnd	Gnd	Gnd
11	**3.3V**	3.2V	3.2V	Open
12	**LED On**	0V	3.2V	Open

P2 Connector to "Side Key" P100

Pin	Label	STBY	Run	Diode Check
1	**Key 1**	3.2V	32V	Open
2	**Gnd**	Gnd	Gnd	Gnd
3	**Key 2**	3.2V	3.2V	Open
4	**Gnd**	Gnd	Gnd	Gnd

Diode Mode values taken with all Connectors Removed



Front Board Connector P100 and J1 Voltage and Diode Check

P100 CONNECTOR "Front IR / Intelligent Sensor" to J1 "Moving LED Board"

Pin	STBY	Run	Diode Check
1	5V	5V	Open
2	Gnd	Gnd	Gnd
3	0.59V	4.9V	Open
4	Gnd	Gnd	Gnd
5	0.75V	5V	Open
6	Gnd	Gnd	Gnd
7	*0V	*3.27V	Open
8	0V	0V	Open

*Pin 7: From Pin 12 of P101 IR board
From Pin 12 of P1200 Main board
From R196 Main board
From Pin GPIO96 of Micro IC100

**J1 "Moving LED Board"
P100 CONNECTOR "Front IR / Intelligent Sensor"**

Pin	Diode Check
1	Open
2	Gnd
3	Open
4	Gnd
5	Open
6	Gnd
7	Open
8	Open

See P100
Table for Voltages

Pin 7: From Pin 7 of P100

Diode Mode values taken with all Connectors Removed



SIDE KEY BOARD SECTION p/n EBR62127501

CH

VOL

ENTER

MENU

INPUT

⏻/I

CHANNEL (^, ˅) Buttons

VOLUME (+, -) Buttons

ENTER Button

MENU Button

INPUT Button

POWER Button

To Ft Control

P100

CH

VOL

ENTER

MENU

INPUT

⏻/I

SW101

SW103

SW105

SW107

SW100

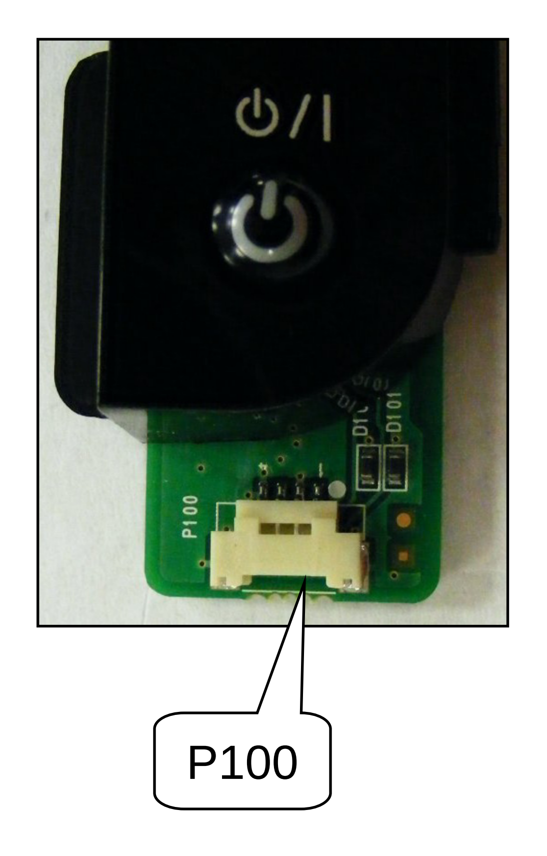
SW102

SW104

SW106

P100

Side Key Assembly P100 Voltage and Diode Check



P100 Resistance Measurements with Key pressed.

KEY	Pin 1 measured from Gnd		KEY	Pin 3 measured from Gnd
Power	270.5 Ohms		Volume (-)	270.5 Ohms
Input	1.8K Ohms		Volume (+)	1.8K Ohms
Menu	4.8K Ohms		CH (Dn)	4.8K Ohms
Enter	10K Ohms		CH (Up)	10K Ohms

P100 Voltage Measurements with Key pressed.

KEY	Pin 1 measured from Gnd		KEY	Pin 3 measured from Gnd
Power	0.179V		Volume (-)	0.179V
Input	0.906V		Volume (+)	0.906V
Menu	1.65V		CH (Dn)	1.65V
Enter	2.24V		CH (Up)	2.24V

P100 Connector “Side Key" to “IR/Intelligent Sensor Board“ P2

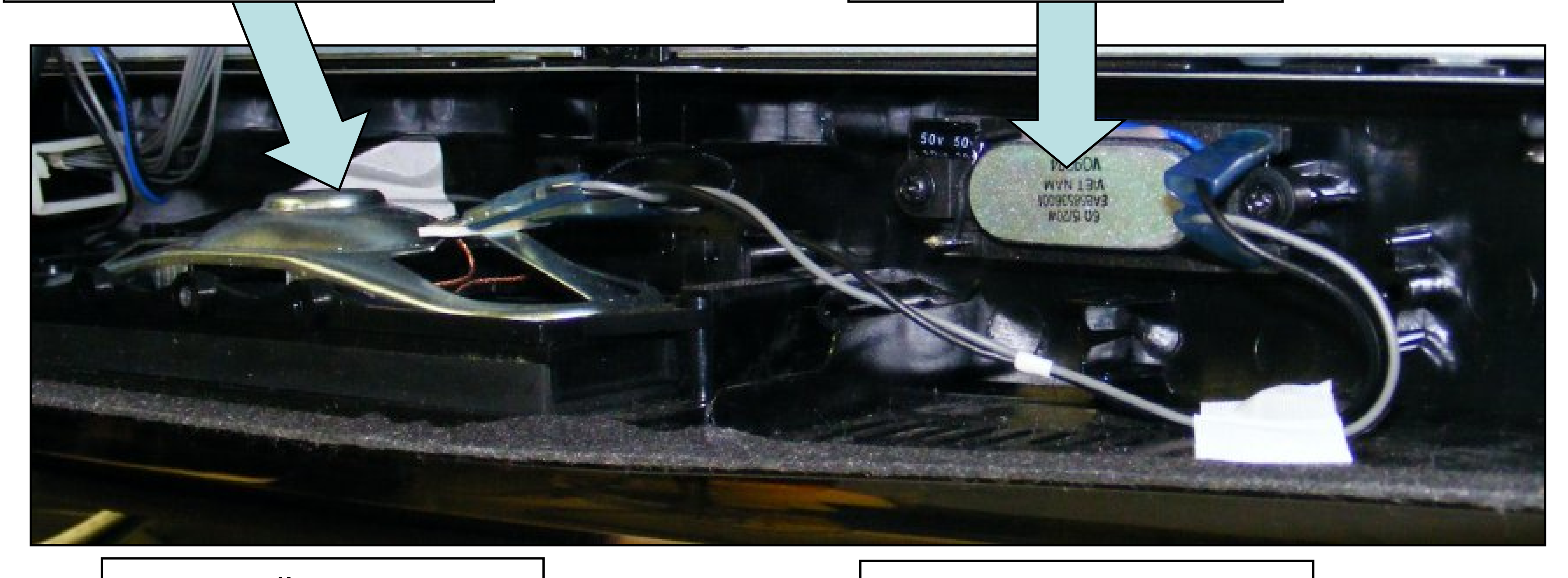
Pin	Label	STBY	Run	Diode Check
1	Key1	3.3V	3.3V	Open
2	Gnd	Gnd	Gnd	Gnd
3	Key2	3.3V	3.3V	Open
4	Gnd	Gnd	Gnd	Gnd

INVISIBLE SPEAKER SECTION

The 42LH90 contains the Invisible Speaker system.
The Full Range Speakers point downward,
so there is no front viewable speaker grill or air ports.

Main Speaker
(Full Range Frequencies)

Tweeter
(High Frequencies)



Full Range
p/n EAB58534501

Tweeter
p/n EAB58536001

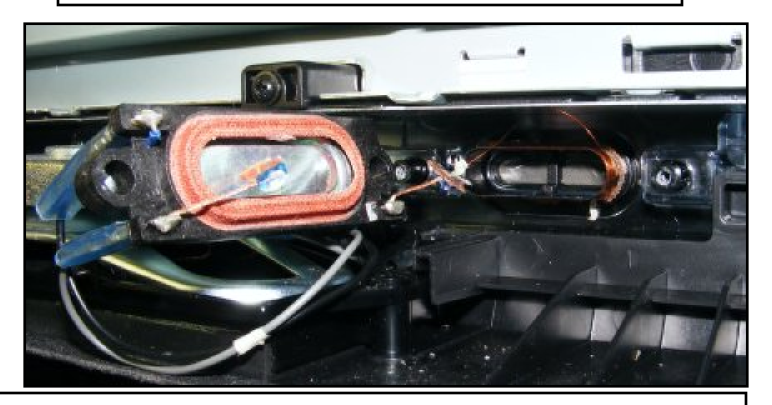
Invisible Speaker System Overview (Tweeters)

Tweeter p/n EAB58536001

Elimination of the conventional speaker.

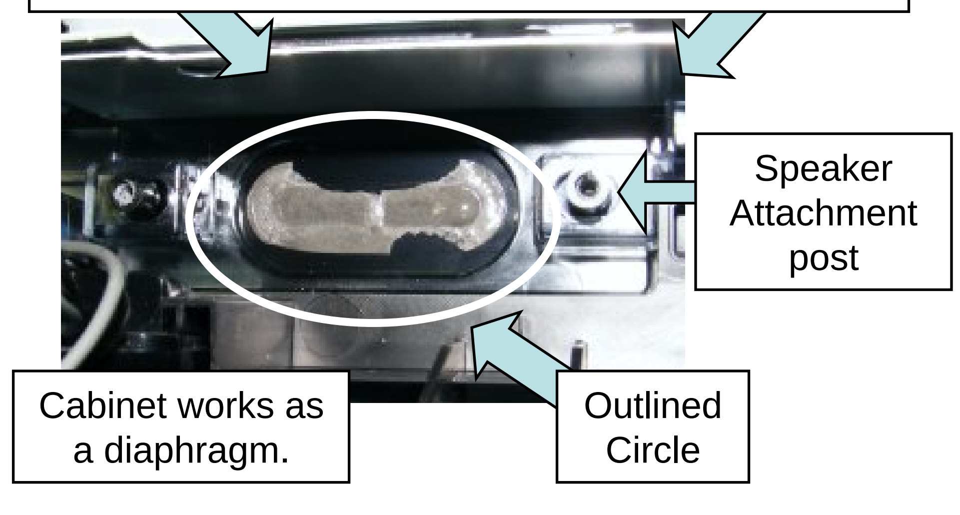
Invisible Speaker has a adhesive surface which adheres to front bezel.





WARNING: Removing the Tweeter will destroy the speaker as shown above. The diaphragm/spider is glued to the front bezel. When removing, it will tear.

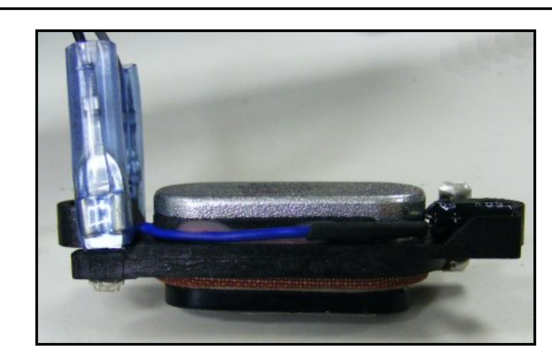
The front bezel is shown below. Note: the outlined circle is the location for the front adhesive pad on the Invisible Speaker. This prevent the coil from bouncing off the plastic causing vibrations.



Speaker Attachment post

Cabinet works as a diaphragm.

Outlined Circle



Invisible Speaker Tweeter shown separately. The Front (down) has an adhesive surface which adheres to front bezel. Note, there is no diaphragm, only voice coil.

Invisible Speaker System Overview

Tweeter p/n EAB58536001

Invisible Speaker Shown separately. Front (to left) has an adhesive surface which adheres to front bezel. Note, there is no Cone (Diaphragm), only voice coil.

Mount

Speaker Terminals

Spider

Speaker Wires

Dust Cap with adhesive

Magnet

Voice Coil Inside

Frequency Pass Capacitor

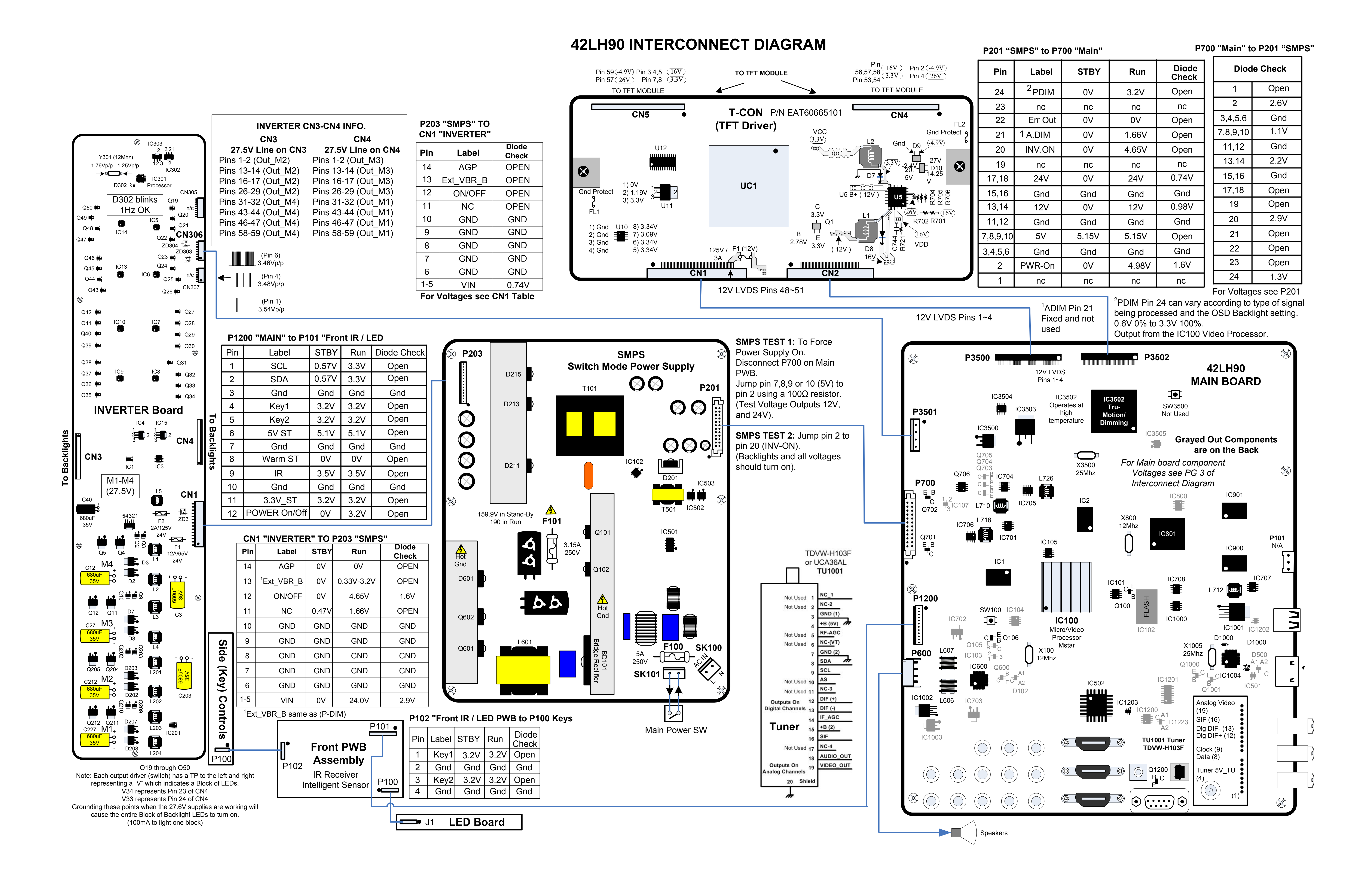
Mount

INTERCONNECT DIAGRAM (11 X 17 FOLDOUT) SECTION

This section shows the 11X17 foldout that's available in the Paper and Adobe version of the Training Manual.

The Adobe version of this Training Manual allows the viewer to zoom in and out making reading of the small text easier.
This Power Point shows a graphical representation of the 11 X 17 foldout page so clarity is limited.

42LH90 INTERCONNECT DIAGRAM



INVERTER CN3-CN4 INFO.

CN3 — 27.5V Line on CN3	CN4 — 27.5V Line on CN4
Pins 1-2 (Out_M2)	Pins 1-2 (Out_M3)
Pins 13-14 (Out_M2)	Pins 13-14 (Out_M3)
Pins 16-17 (Out_M2)	Pins 16-17 (Out_M3)
Pins 26-29 (Out_M2)	Pins 26-29 (Out_M3)
Pins 31-32 (Out_M4)	Pins 31-32 (Out_M1)
Pins 43-44 (Out_M4)	Pins 43-44 (Out_M1)
Pins 46-47 (Out_M4)	Pins 46-47 (Out_M1)
Pins 58-59 (Out_M4)	Pins 58-59 (Out_M1)

P203 "SMPS" TO CN1 "INVERTER"

Pin	Label	Diode Check
14	AGP	OPEN
13	Ext_VBR_B	OPEN
12	ON/OFF	OPEN
11	NC	OPEN
10	GND	GND
9	GND	GND
8	GND	GND
7	GND	GND
6	GND	GND
1-5	VIN	0.74V

For Voltages see CN1 Table

P201 "SMPS" to P700 "Main"

Pin	Label	STBY	Run	Diode Check
24	[2]PDIM	0V	3.2V	Open
23	nc	nc	nc	nc
22	Err Out	0V	0V	Open
21	[1] A.DIM	0V	1.66V	Open
20	INV.ON	0V	4.65V	Open
19	nc	nc	nc	nc
17,18	24V	0V	24V	0.74V
15,16	Gnd	Gnd	Gnd	Gnd
13,14	12V	0V	12V	0.98V
11,12	Gnd	Gnd	Gnd	Gnd
7,8,9,10	5V	5.15V	5.15V	Open
3,4,5,6	Gnd	Gnd	Gnd	Gnd
2	PWR-On	0V	4.98V	1.6V
1	nc	nc	nc	nc

P700 "Main" to P201 "SMPS"

Diode Check	
1	Open
2	2.6V
3,4,5,6	Gnd
7,8,9,10	1.1V
11,12	Gnd
13,14	2.2V
15,16	Gnd
17,18	Open
19	Open
20	2.9V
21	Open
22	Open
23	Open
24	1.3V

For Voltages see P201

P1200 "MAIN" to P101 "Front IR / LED

Pin	Label	STBY	Run	Diode Check
1	SCL	0.57V	3.3V	Open
2	SDA	0.57V	3.3V	Open
3	Gnd	Gnd	Gnd	Gnd
4	Key1	3.2V	3.2V	Open
5	Key2	3.2V	3.2V	Open
6	5V ST	5.1V	5.1V	Open
7	Gnd	Gnd	Gnd	Gnd
8	Warm ST	0V	0V	Open
9	IR	3.5V	3.5V	Open
10	Gnd	Gnd	Gnd	Gnd
11	3.3V_ST	3.2V	3.2V	Open
12	POWER On/Off	0V	3.2V	Open

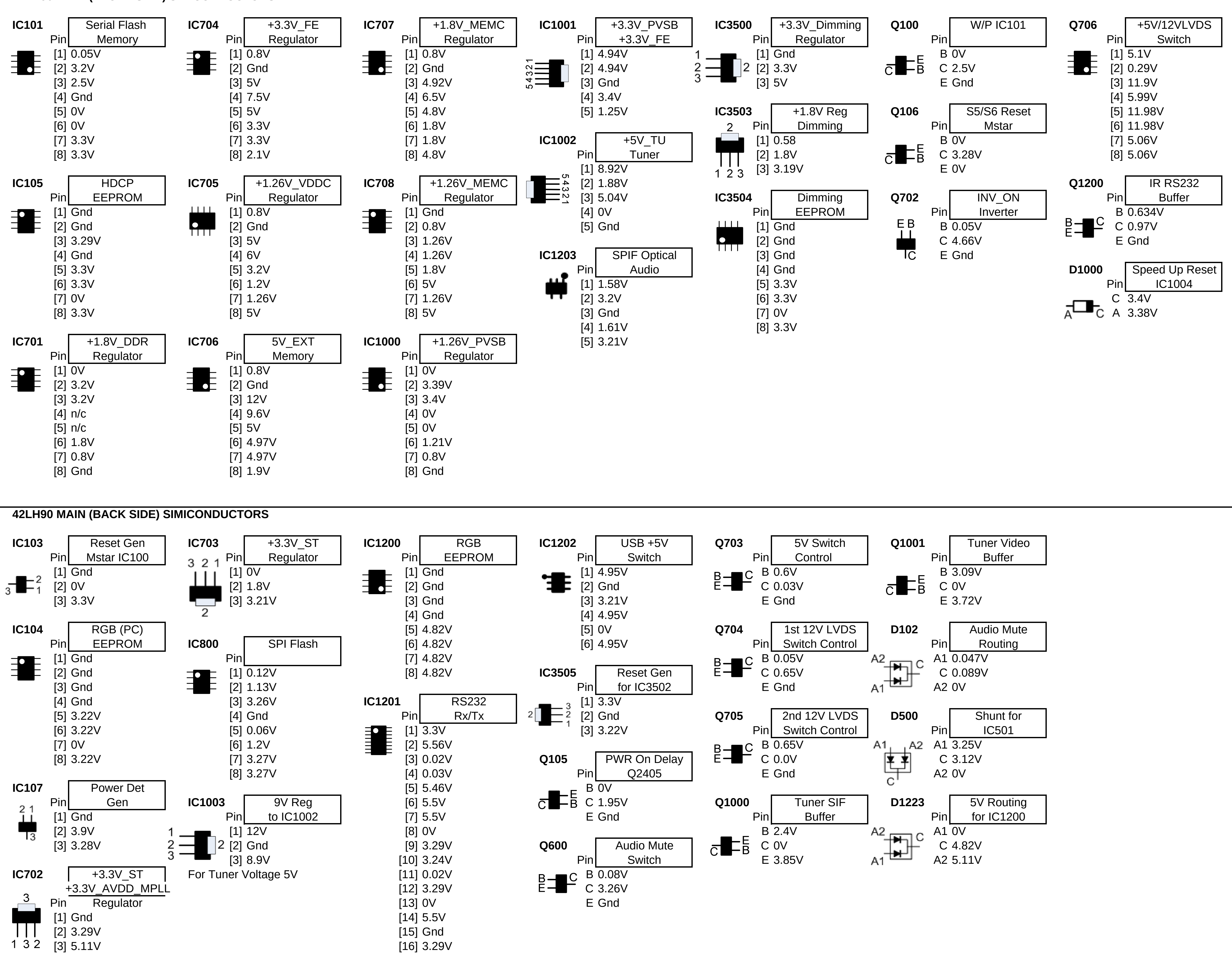
CN1 "INVERTER" TO P203 "SMPS"

Pin	Label	STBY	Run	Diode Check
14	AGP	0V	0V	OPEN
13	[1]Ext_VBR_B	0V	0.33V-3.2V	OPEN
12	ON/OFF	0V	4.65V	1.6V
11	NC	0.47V	1.66V	OPEN
10	GND	GND	GND	GND
9	GND	GND	GND	GND
8	GND	GND	GND	GND
7	GND	GND	GND	GND
6	GND	GND	GND	GND
1-5	VIN	0V	24.0V	2.9V

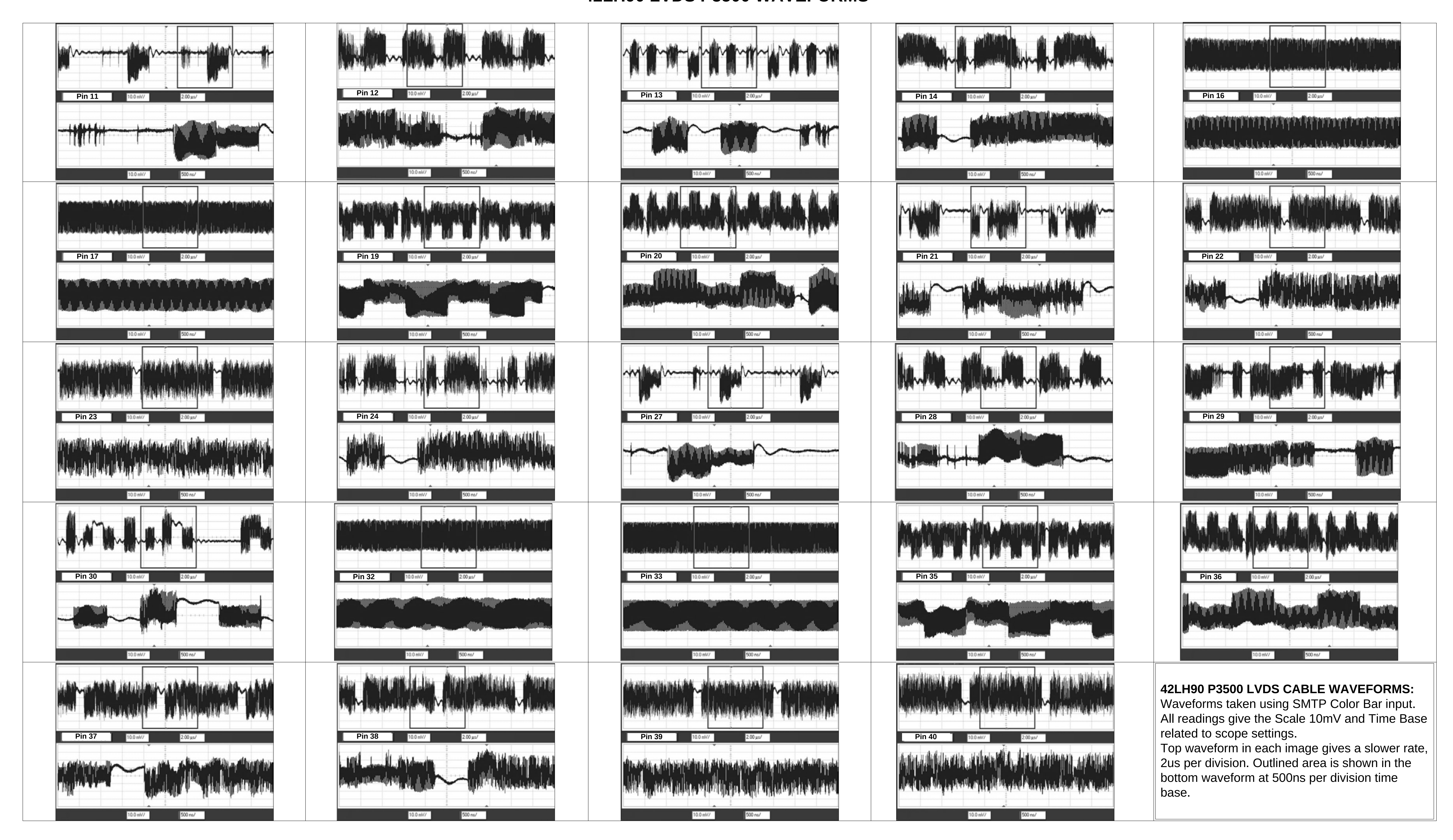
[1]Ext_VBR_B same as (P-DIM)

P102 "Front IR / LED PWB to P100 Keys

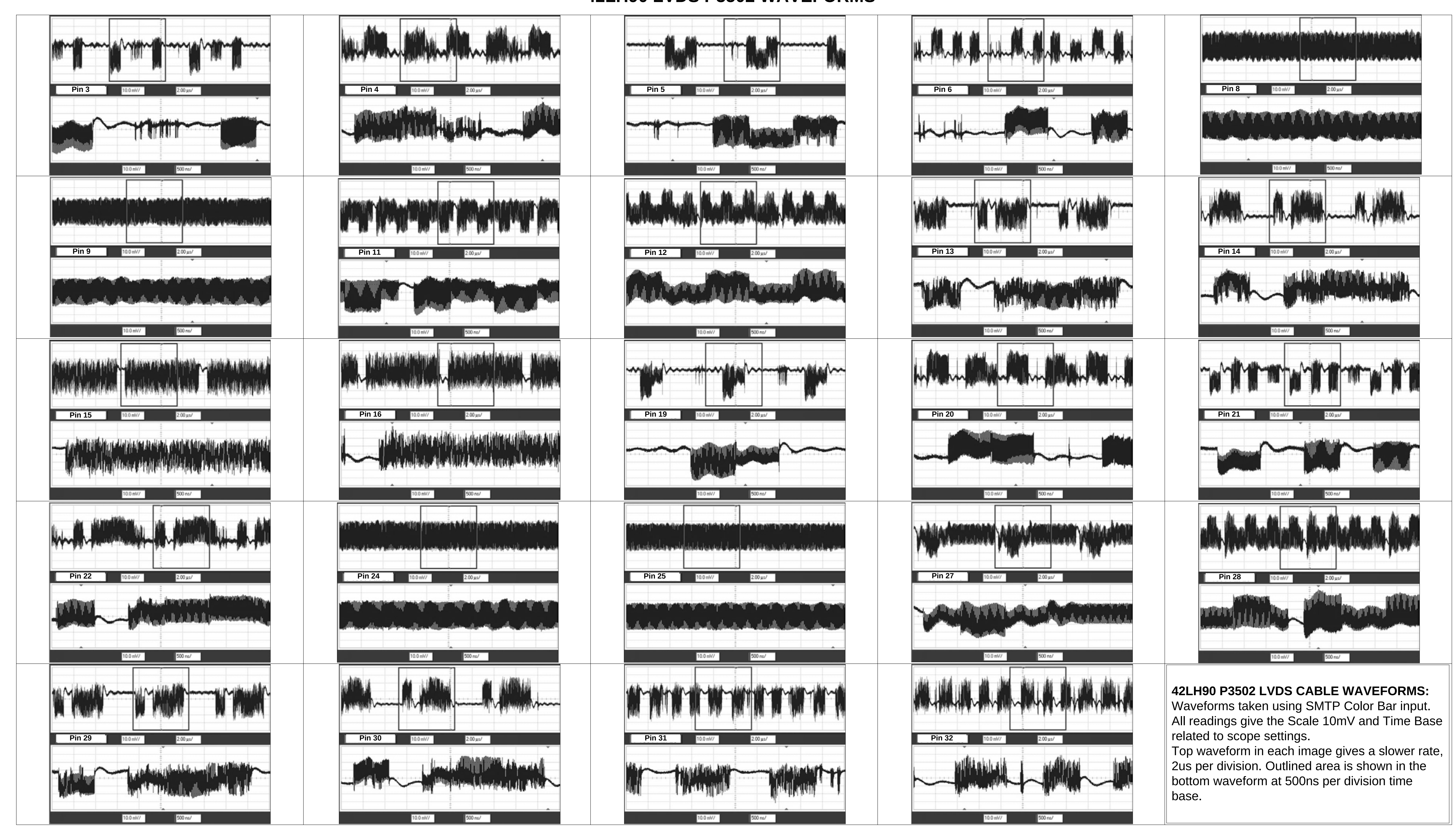
Pin	Label	STBY	Run	Diode Check
1	Key1	3.2V	3.2V	Open
2	Gnd	Gnd	Gnd	Gnd
3	Key2	3.2V	3.2V	Open
4	Gnd	Gnd	Gnd	Gnd


42LH90 MAIN (FRONT SIDE) SIMICONDUCTORS
IC101 Serial Flash Memory
Pin [1] 0.05V [2] 3.2V [3] 2.5V [4] Gnd [5] 0V [6] 0V [7] 3.3V [8] 3.3V
IC704 +3.3V_FE Regulator
Pin [1] 0.8V [2] Gnd [3] 5V [4] 7.5V [5] 5V [6] 3.3V [7] 3.3V [8] 2.1V
IC707 +1.8V_MEMC Regulator
Pin [1] 0.8V [2] Gnd [3] 4.92V [4] 6.5V [5] 4.8V [6] 1.8V [7] 1.8V [8] 4.8V
IC1001 +3.3V_PVSB +3.3V_FE
Pin [1] 4.94V [2] 4.94V [3] Gnd [4] 3.4V [5] 1.25V
IC3500 +3.3V_Dimming Regulator
Pin [1] Gnd [2] 3.3V [3] 5V
Q100 W/P IC101
Pin B 0V C 2.5V E Gnd
Q706 +5V/12VLVDS Switch
Pin [1] 5.1V [2] 0.29V [3] 11.9V [4] 5.99V [5] 11.98V [6] 11.98V [7] 5.06V [8] 5.06V
IC3503 +1.8V Reg Dimming
Pin [1] 0.58 [2] 1.8V [3] 3.19V
Q106 S5/S6 Reset Mstar
Pin B 0V C 3.28V E 0V
IC1002 +5V_TU Tuner
Pin [1] 8.92V [2] 1.88V [3] 5.04V [4] 0V [5] Gnd
IC105 HDCP EEPROM
Pin [1] Gnd [2] Gnd [3] 3.29V [4] Gnd [5] 3.3V [6] 3.3V [7] 0V [8] 3.3V
IC705 +1.26V_VDDC Regulator
Pin [1] 0.8V [2] Gnd [3] 5V [4] 6V [5] 3.2V [6] 1.2V [7] 1.26V [8] 5V
IC708 +1.26V_MEMC Regulator
Pin [1] Gnd [2] 0.8V [3] 1.26V [4] 1.26V [5] 1.8V [6] 5V [7] 1.26V [8] 5V
IC3504 Dimming EEPROM
Pin [1] Gnd [2] Gnd [3] Gnd [4] Gnd [5] 3.3V [6] 3.3V [7] 0V [8] 3.3V
Q702 INV_ON Inverter
Pin B 0.05V C 4.66V E Gnd
Q1200 IR RS232 Buffer
Pin B 0.634V C 0.97V E Gnd
IC1203 SPIF Optical Audio
Pin [1] 1.58V [2] 3.2V [3] Gnd [4] 1.61V [5] 3.21V
D1000 Speed Up Reset IC1004
Pin C 3.4V A 3.38V
IC701 +1.8V_DDR Regulator
Pin [1] 0V [2] 3.2V [3] 3.2V [4] n/c [5] n/c [6] 1.8V [7] 0.8V [8] Gnd
IC706 5V_EXT Memory
Pin [1] 0.8V [2] Gnd [3] 12V [4] 9.6V [5] 5V [6] 4.97V [7] 4.97V [8] 1.9V
IC1000 +1.26V_PVSB Regulator
Pin [1] 0V [2] 3.39V [3] 3.4V [4] 0V [5] 0V [6] 1.21V [7] 0.8V [8] Gnd
42LH90 MAIN (BACK SIDE) SIMICONDUCTORS
IC103 Reset Gen Mstar IC100
Pin [1] Gnd [2] 0V [3] 3.3V
IC703 +3.3V_ST Regulator
Pin [1] 0V [2] 1.8V [3] 3.21V
IC1200 RGB EEPROM
Pin [1] Gnd [2] Gnd [3] Gnd [4] Gnd [5] 4.82V [6] 4.82V [7] 4.82V [8] 4.82V
IC1202 USB +5V Switch
Pin [1] 4.95V [2] Gnd [3] 3.21V [4] 4.95V [5] 0V [6] 4.95V
Q703 5V Switch Control
Pin B 0.6V C 0.03V E Gnd
Q1001 Tuner Video Buffer
Pin B 3.09V C 0V E 3.72V
IC104 RGB (PC) EEPROM
Pin [1] Gnd [2] Gnd [3] Gnd [4] Gnd [5] 3.22V [6] 3.22V [7] 0V [8] 3.22V
IC800 SPI Flash
Pin [1] 0.12V [2] 1.13V [3] 3.26V [4] Gnd [5] 0.06V [6] 1.2V [7] 3.27V [8] 3.27V
Q704 1st 12V LVDS Switch Control
Pin B 0.05V C 0.65V E Gnd
D102 Audio Mute Routing
Pin A1 0.047V C 0.089V A2 0V
IC3505 Reset Gen for IC3502
Pin [1] 3.3V [2] Gnd [3] 3.22V
IC1201 RS232 Rx/Tx
Pin [1] 3.3V [2] 5.56V [3] 0.02V [4] 0.03V [5] 5.46V [6] 5.5V [7] 5.5V [8] 0V [9] 3.29V [10] 3.24V [11] 0.02V [12] 3.29V [13] 0V [14] 5.5V [15] Gnd [16] 3.29V
Q705 2nd 12V LVDS Switch Control
Pin B 0.65V C 0.0V E Gnd
D500 Shunt for IC501
Pin A1 3.25V C 3.12V A2 0V
Q105 PWR On Delay Q2405
Pin B 0V C 1.95V E Gnd
IC107 Power Det Gen
Pin [1] Gnd [2] 3.9V [3] 3.28V
IC1003 9V Reg to IC1002
Pin [1] 12V [2] Gnd [3] 8.9V
For Tuner Voltage 5V
Q1000 Tuner SIF Buffer
Pin B 2.4V C 0V E 3.85V
D1223 5V Routing for IC1200
Pin A1 0V C 4.82V A2 5.11V
Q600 Audio Mute Switch
Pin B 0.08V C 3.26V E Gnd
IC702 +3.3V_ST +3.3V_AVDD_MPLL Regulator
Pin [1] Gnd [2] 3.29V [3] 5.11V

42LH90 LVDS P3500 WAVEFORMS



42LH90 LVDS P3502 WAVEFORMS





42LH90

Direct View LCD





This concludes the 42LH90 training session.